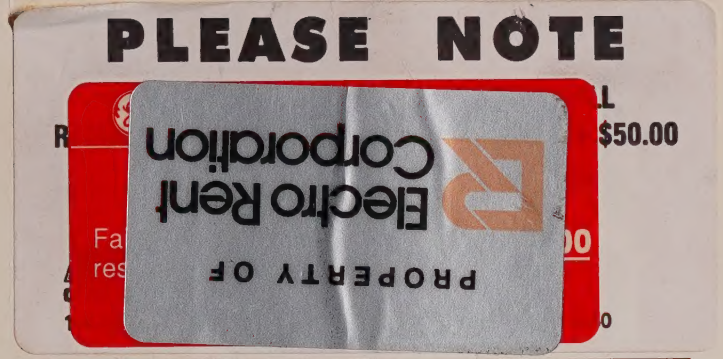

VELONEX

Instruction Manual
Model V-3113

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Serial # 16735

All information contained herein is believed to be accurate and correct. However, no responsibility for errors, omissions or any problem arising by the use of this material is assumed by Velonex.

WARNING

The Model V-3113 Fast Transient Generator contains voltages which could be dangerous if contacted. All reasonable safety precautions have been taken in the design and manufacture of this instrument. DO NOT attempt to defeat the protection provided. Power should be removed and high voltage capacitors should be discharged prior to any maintenance work. Only recommended replacement parts should be used. The Model V-3113 should be operated and maintained only by personnel qualified to work with high voltage equipment.

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Prior to Installation

1 Claim For Damage in Shipment This instrument should be tested as soon as possible after receipt. If it fails to operate properly, or is damaged in any way, a claim should be filed with the carrier. A full report of the damage should be obtained by the claim agent and this report should be forwarded to Velonex. We will then advise you of the disposition to be made of the equipment and arrange for repair or replacement. Include model number and serial number when referring to this instrument for any reason.

2 Warranty Velonex warrants each instrument manufactured by us to be free from defects in material and workmanship. Our liability under this warranty is limited to servicing or adjusting any instrument returned to the factory for that purpose and to replace any defective parts thereof. This warranty is effective for one year after delivery to the original purchaser when the instrument is returned, transportation charges prepaid by the original purchaser, and when upon our examination, it is disclosed to our satisfaction to be defective. If the fault has been caused by misuse or abnormal conditions or operation, repairs will be billed at cost. In this case, an estimate will be submitted before the work is started.

If any fault develops, the following steps should be taken:

1. Notify us, giving full details of the difficulty and include the model number and serial number. On receipt of this information, we will give you service data or shipping instructions.

2. On receipt of shipping instructions, forward the instrument prepaid to the factory. If requested, instrument is not covered by the warranty.

3 Shipping All shipments of Velonex instruments should be made via Air or alternately via Truck if shipping distance is under 300 miles. The instrument(s) should be either repackaged in the original shipping container or packed in a strong exterior container and surrounded by at least three inches of excelsior or similar shock absorbing material.

4 Proprietary Notice Information contained in this manual is the property of Velonex. It is issued with the understanding that none of this material may be reproduced or copied without written permission from Velonex.

General Description

1 Introduction The Velonex Model V-3113 is a fast transient generator used to test the surge withstand capability (SWC) of protective relays and relay systems. It contains a built-in transient coupler/isolation network allowing the generator's output to be fed to the equipment under test (EUT) while isolating the transients from feeding upstream into the power mains.

The Model V-3113 is an easy to operate, cost effective GPIB bus programmable generator.

2 Model V-3113 Fast Transient Generator Specifications:

Maximum Pulse Amplitude (Eo):	5kV (Open Circuit)
Rise Time (Tr):	<10ns (10-90%)
Pulse Width (Tw):	>50ns (at 90%)
Decay (Td):	150ns; ±50ns (at 100-50%)
Source Impedance (Zo) during Tr:	80Ω ± 20% Effective
Pulse Repetition Frequency:	1-100Hz (1Hz steps)
Output Current S.C.:	>50A (@5000V O.C.)
Timed Output:	1-99 seconds selectable or continuous output.
Output Polarity:	Front Panel Selectable
Shielding:	Surge Signals are shielded to prevent unwanted radiation or conductance of signals.
Scope Trigger Output:	A ground isolated front panel oscilloscope trigger provides synchronization with the pulse event.
Metering:	A front panel digital panel voltmeter indicates approximate peak output voltage into an open circuit.
Ready Indicator:	A front panel green indicator light advises the operator when the unit is ready for test.
GPIB Programmability:	The Model V-3113 can be programmed via the GPIB Bus through an external connector on the rear of the Model V-3113.
High-Voltage Protection:	A push on/off high voltage switch is utilized to switch on and off high voltage. A front panel interlock can be utilized for safety high voltage turn off for test fixtures.

3 Model V-3113 Coupler/Isolation Network Specifications:

Phase Synchronization:	Synchronized to EUT power 0°-360° in 1°
Injection Mode:	One normal and three common modes are front panel selectable.
EUT Max AC Line Voltage:	277V RMS, 50/60Hz
EUT Max AC Line Current:	15A RMS continuous current to load
EUT Max DC Voltage:	350 VDC
EUT Max DC Current:	15A DC continuous current to load
Power Requirements:	Line input is 115V/230V +/-10%, 50/60Hz, 200 watts. Output is regulated to minimize the effects of input line variations. For other power requirements order the following options. 100V +10%, 60Hz for Model V-3113-J 100V +10%, 50Hz for Model V-3113-Q 200V +10%, 50Hz for Model V-3113-W
Mechanical:	Housed in a cabinet 19-3/4" wide, 8 1/4" high, and 21-1/2" depth. Standard 19" rack-mounting is also available, specify Model V-3113-R
Weight:	Approximately 90 lb. (cabinet model)

4 Available Options:

Option Designator	Description
D	DC Injection Capability
H	30A Isolation Network
R	Rack Mounting
S	GPIB Programmability

Front Panel

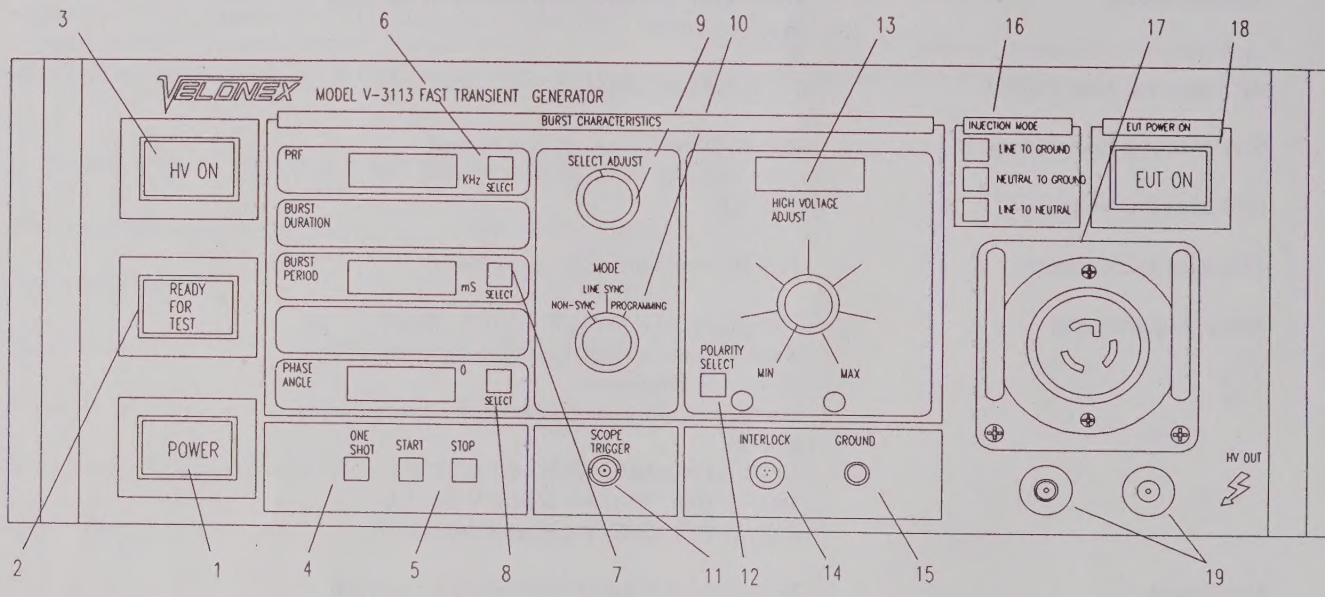

Figure 1 V-3113 Front Panel

The following is a brief description of the V-3113 front panel controls. Please refer to Figure 1 for a visual location.

1 Power Push Button The Power Push Button is the main power switch which controls all power to the unit. As soon as the power switch is pushed, a four minute warm-up is required by the Model V-3113. A four minute counter is visible on the "Test Time" Display. During this four minute warm-up time, none of the buttons on the Model V-3113 are operable until the warm up time has expired. After four minutes, the Model V-3113 is ready for testing.

2 Ready for Test Indicator The Ready for Test Indicator is located on the front panel and is illuminated after a four minute warm up period. This light will remain illuminated until the Model V-3113 is turned off.

Note: Each time the Model V-3113 is turned-on, the ready-for-test light will take four minutes to be illuminated.

3 HV-ON Push Button The high voltage output will be turned on when the HV-ON Button has been pushed. Pressing the high voltage button while high voltage is on will turn the high voltage off.

4 One-Shot Push Button The One-Shot push button will produce a single pulse when pressed.

5 Start/Stop Push Buttons When the Green start button is pushed, continuous fast transients with the displayed PRF will appear at the output, as long as the red stop button is not pushed.

6 PRF Push Button When this button has been pressed, the frequency of the pulses can be adjusted by the adjust knob located on the front panel. The frequency can be adjusted in steps of 0.1Hz from 1Hz to 100Hz.

7 Test Time Push Button When this button has been pressed, the test time can be adjusted with the adjust knob from 1s to 99s in steps of 0.1s.

Note: For Free Running Mode, increase the test time to more than 99s, such that no digits are visible on the test time display. Press the start button for continuous testing, then press the red stop button to stop testing at any time desired.

8 Phase Angle Push Button When in the line-sync mode and this button has been pressed, the phase angle can be adjusted with the adjust knob from the 0° to 360° in steps of 1°.

9 Select Adjust Knob This knob allows the operator to increase or decrease any variable discussed in items 6 through 9. When this knob is turned clockwise the variable will increase, and when this knob is turned counterclockwise the variable will decrease accordingly.

10 Mode Select Switch

Position 1:	Non-Sync Selects an asynchronous trigger that runs at the settings of the front panel displays. Note that the phase angle display will not come on.
Position 2:	Line Sync Selects an AC power line synchronized trigger that runs at the settings of the front panel phase angle display. The Line Sync trigger is phase synced from 0° to 360°. The AC Power line is the source for the E.U.T.
Position 3:	Programming Selects the unit for programming via the GPIB connector in the rear of the Model V-3113-S. While in this mode the unit can be addressed and controlled by a GPIB controller. The front panel controls in this mode are disable with the exception of the high voltage off button, the interlock and the power off button.

11 Scope Trigger Output A Scope Trigger is obtained by attaching a BNC Connector to the front panel. This provides a trigger pulse for oscilloscope synchronizing purposes. The Trigger is of positive polarity and approximately 5 volts. A Scope Trigger is present whenever start is on.

12 Polarity Push Button Pulse Polarity is selected via the push button located on the front panel. Two LED's are incorporated to indicate a positive or negative output.

13 Panel Meter The DPM (Digital Panel Meter) indicates the approximate peak voltage when the High voltage light is on. The meter is provided for reference purposes, and should not be used for accurate pulse measurements.

14 High-Voltage Interlock In order for high voltage to be turned on, pins 1 and 2 of connector J104 on the front panel (Figure-6.4) must be shorted together. This can easily be accomplished with plug P104 provided with the unit or an interlock cable when using the V-3113 in conjunction with a test fixture.

15 Ground Lug

16 Injection Mode Push Buttons The filter allows for three common mode tests, and one normal mode test . By pressing the two of the appropriate push button three different common modes of injection can be activated; line to ground, neutral to ground and line + neutral to ground. By pressing the appropriate push button one normal mode of injection can be activated; line to neutral.

17 Plug-In The plug-in cavity is the output for AC/Pulse events when using the internal coupler isolation network. There are different plug-in assemblies for different power configurations. The following table describes the different plug-ins and there Nema & Hubbell equivalents.

The V-3434 comes standard with the V-3113 while the V-3431 or the V-3432 must be ordered separately.

18 EUT Power On/OFF When this yellow button is pushed, a pulse (or repetitive EFT/Bursts) can be injected to the equipment under test via the AC/Pulse output connector J115 on the front panel. When the EUT power is off, the pulse is delivered through the high-voltage Pulse Output Connector. AC line Voltage: Maximum Line voltage to load, 277V RMS, 50/60Hz.

AC Line Current: Maximum continuous current to load 15A RMS.

19 Pulse Output Connectors CAUTION: High Voltage in excess of 5kV can appear on the HN Connector. Exercise extreme caution when handling.

A HN Connector, J103 (Velonex part number, 150-0362), is used as pulse output connector and two HN Cable Assemblies (Velonex part number, 900-21321) should be used for connecting coupled transients to I/O and control lines.

A HN ground plug (P103) can be used for common mode testing of I/O and control lines. By grounding the low output the output polarity at the high output can be controlled via the front panel push button.

Floating the output connectors allow transverse injections of fast transients to I/O and control lines.

Rear Panel

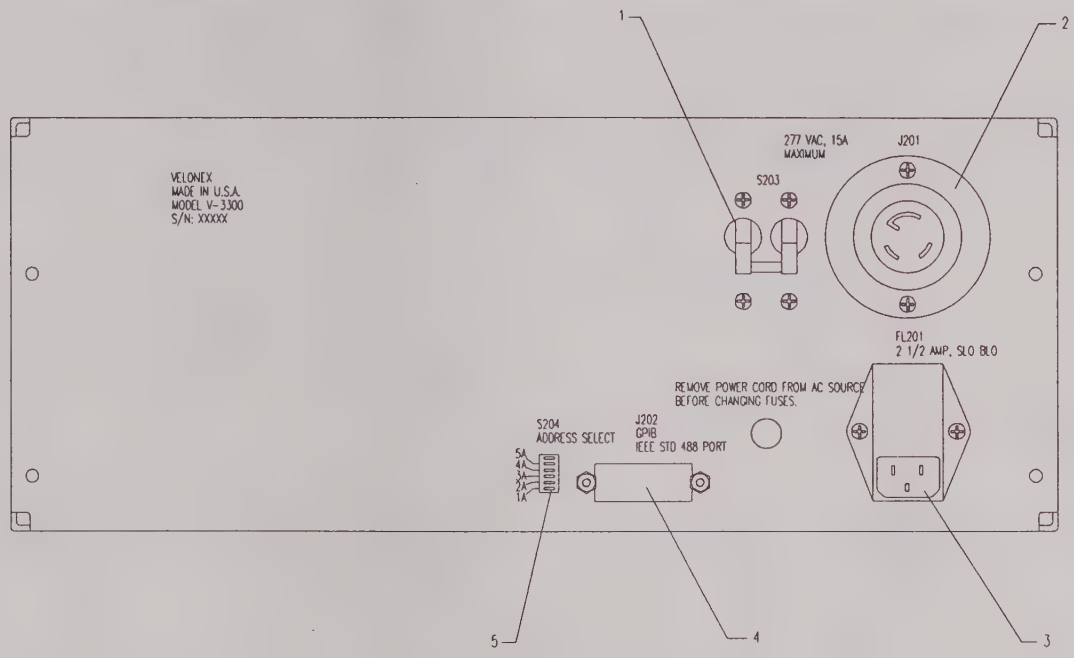

Figure 2 V-3113 Rear Panel

1 EUT Power Reset A magnetic circuit breaker is located on rear panel to protect the EUT from a short circuit failure. The circuit breaker is rated for 15 amperes. If the EUT draws more than 15 amperes, the circuit breaker will create an open circuit. In this case, turn the EUT power off, remove the EUT, then flip the Circuit Breaker up into the on position for EUT power to reset.

2 EUT Power Input The EUT power input is the feed for the internal coupler/isolation network. The power applied at this input connector will be present at the front panel output cavity when the EUT POWER push button is active. The fast transient signal is attenuated at this point to prevent damage to supplementary equipment connect to the same power source that is being feed into the isolation network.

3 Line Power Cable / Fuse The three conductor power cable of the Model V-3113, ends within a polarized three prong male and female connector. Plug the female end into the Model V-3113 line filter located on the rear panel, then plug the male connector into an AC outlet.

A fuse is used to protect the instrument, and is located in the line filter. In case this fuse blows, remove the fuse and replace it with a SLO-BLO 3A 250VAC fuse. If the fuse blows again consult a qualified service personnel for a diagnosis.

4 Programming Connector
Provides a data input port with the IEEE 488 data bus.

5 Programming Address Select

Interlocks As a safety feature, the Model V-3113 incorporates active cover interlocks. For the V-3113 to operate both top and bottom interlocks must be closed.

Remote Programming

1 Remote Programming In order to begin programming the V-3113 a basic understanding of the programming theory is required. The V-3113 can be programmed through the GPIB bus(General purpose interface bus). The V-3113 will accept a string of ASCII character delimited by a carriage return. The string will be analyzed for content and an action will be taken depending on the content.

The string syntax is basically composed of three parts a mnemonic , a semicolon , and an determining value.

Ex.

AMP:2000	(1)
PRF:0150	(2)
LTG:ON	(3)

The mnemonic is a abbreviated representation of a front panel control as in example (1) AMP is an abbreviation for Amplitude, in example (2) PRF is an abbreviation for Pulse Repetition Frequency and example (3) LTG is an abbreviation for Line To Ground injection. Table 2 lists all the acceptable mnemonics.

The determining value can be either a four digit integer or a short word.

The four digit integer is superimposed on the front panel display so no decimal is required. In example (1) 2000 will display a 2000 in the amplitude display so the amplitude would be 2000 volts into an Open Circuit. Example (2) 0150 will cause 150 to be displayed in the PRF display so the output frequency would be 15.0 Hz.

The short "word" can be either ON, OFF, P or N depending of the mnemonic preceding. In example (3) the ON value will cause the output to injected onto the Line signal with respect to ground. An OFF value will turn the injection off.

TABLE 2

2 Model V-3113 Fast Transient Generator Specifications:

AMP:XXXX	Output **AMP**litude 0000 < XXXX < 5000
ANG:XXXX	Phase **ANG**le synchronization 0000 < XXXX < 0360 (0 - 360 degrees) A value > 0360 will put the V-3113 into the non-sync mode.
EUT:ON/OFF	**EUT** Power on or off
HIV:ON/OFF	**HI**gh Voltage on or off
LTG:ON/OFF	**L**ine **T**o **G**round injection on or off
NTG:ON/OFF	**N**eutral **T**o **G**round injection on or off
OSH	Initiates **O**ne **SH**ot
LTN:ON/OFF	**L**ine **T**o **N**eutral injection on or off
POL:P/N	Output **POL**arity positive or negative
PRF:XXXX	**P**ulse **R**epetition **F**requency0.100 - 5500 KHz 0100 < XXXX < 5500 (0.1 - 5.5 KHz)
STP	**STo**P testing
STR	**STaR**t testing
TST:XXXX	**TeS**t Time 0001 < XXXX < 0990 (1 - 99 seconds) A value > 0990 will put the V-3113 into continuous output mode.

Operating Instructions

1 Calibration Verification Operating Instructions

The following describes how to perform verification testing of the V-3113 fast transient generator.

CAUTION: Do not turn on high voltage until all signal connections have been made.

1. Plug the AC power cord into a 115 VAC, ± 10%, 60Hz power source.
2. Connect the Model V-3113 Scope Trigger to the External Trigger of an Oscilloscope.
3. Push the "White" power button and wait four minutes for warm-up time.
4. Select the "frequency" by pushing the frequency select push button, them adjust the frequency with the adjust knob to a value of 60Hz..
5. Select the "test" time by pushing the test time push button, then adjusting the time with the adjust knob to the continuos mode by increasing the test time value to greater than 99 seconds.
6. Connect a 100x high-voltage probe with at least a 400 MHz bandwidth to the output connector 1 (J103) through the adapter P101.
7. Ground output connector 2 (J104) with the supplied shorting plug (P103).
8. Set the Mode Select switch to the Non-Sync mode. If the Non-Sync mode is selected the phase angle will not be enabled.
9. With the "Green" ready-for-test light lit, push the HV-ON button once to turn the high-voltage on. Pressing the high-voltage button again will turn off the high voltage

Caution: Do not touch or otherwise contact the high-voltage output connector, as long as the high voltage is on!

10. Set the output Amplitude by adjusting the Amplitude adjust knob 5000 volts. The displayed value is the approximate peak value into a open circuit.
11. Set the oscilloscope to 20ns/div, 5V/div (if not using a scope which automatically compensates the scope input).
12. To initiate a pulse, press the single shot push button and view the pulse on the oscilloscope. To initiate a series of pulses continuously, press the green "start" push button.
13. Measure the peak voltage and adjust the voltage with the voltage adjust knob until the peak voltage measures 5.0 kV. The rise time should be <10 ns (10%-90%) and the width should be >50ns (90%-90%). The decay time should be 100ns ± 50 ns (100% to 50%).
14. Stop the generator's output by simply press the red stop push button.
15. Turn the high-voltage off by pushing the HV-ON button.
16. To turn all the power off, push the Power button.

2 EUT Power Supply Testing Instructions

The following describes how to perform quality testing of EUT's power supplies installed in relay systems.

1. Connect the appropriate line power to the twist lock connector J201 located on the rear panel.
2. Plug the E.U.T.'s power cord into the Plug-In receptacle J115 on the front of the Model V-3113.
3. Press the yellow E.U.T. power to allow power to the E.U.T.
4. Turn the E.U.T. on.
5. Select the required injection mode.
6. With the various output characteristics selected press start to be testing.
7. When testing is complete, turn off the high voltage. Turn-off power to the Model V-3113.

2 Additional Caution Notes This instrument uses air convection for proper internal cooling. Do not restrict the air flow in any way.

In order to prolong the life of the components within the Model V-3113, turn the high-voltage off when the instrument is not in use. The instrument should not be left operating with a continuous trigger when not required.

Circuit Descriptions

1 . General Information The Velonex Model V-3113 is a Thyratron based design that incorporates a built-in coupler/isolation network for line injection. The Model V-3113 uses circuitry to determine the pulse width, rise and decay times. The PRF, burst duration, burst period, phase angle and test time are fully microcomputer controlled. The selection of each parameter can be selected by front panel push buttons (See Figure-4). The pulse switching networks of the generator are not field serviceable. Schematic diagrams of these parts are not included. If any problem arises, please contact Velonex.

2 Power-On Circuits When the Power switch (S118) closes, transformers T201, T202, T401 and T402 are energized. With the power on fans B201, B202 and B401 are energized. Line filter FL201 contains the power fuse for the unit and also act as a low pass filter to filter out high frequency noise on the AC power lines. MOV's RV401 - RV404 are utilized to suppress any power surges which might be exposed to the unit.

3 GRIDS Drive Circuitry To achieve full performance capability of the Thyratron, the drive pulses should be optimum. GRID 1 is driven by one mosfet device. A TTL level signal , trigger 1, drives Z601A which in turn drives Z602A. Transformer T601 is a pulse transformer that is used to isolate the TTL level voltage from the 800 volts supply. The peak GRID 1 output voltage is about 800 volts. GRID 2 is also driven by one mosfet device. TRIG2, a TTL level trigger, drives Z601B and in turn drives Z602B. Transformers T601B is used to isolate the TTL level voltage from the 800 volt supply. The peak GRID 2 output voltage is also about 800V. A negative bias of 100 volts sits below the 800 volt grid 2 pulse to hold off the thyratron anode voltage. The GRID 2 trigger pulse is delayed relative to GRID 1 pulse to allow the discharge to become established.

4 HV-ON Circuitry When the HV-ON momentary switch S101 is pressed, relay K401 will activate providing DC power to HV DC to DC converters PS1601 and PS202. PS1601 is controlled via a 0 - 5V signal generated by Z2401 D/A converter. PS1601 supplies the Thyratrons anode voltage which is directly proportional to the output voltage. Capacitor C1601 store the energy for the burst of output pulses. PS202 provides the 800 V requied for the grid pulses. Capacitors C512-C515 store the energy required for the grid pulses.

5 Power Supplies The Model V-3113 uses seven DC power supplies:

1. A 6.3V power supply for the cathode heater. This power supply is regulated through transformers T201, CR201, C201 and R201.

2. A 5.3VDC power supply for the reservoir heater of the Thyratron. This power supply is regulated, positive 5.3 volts DC source employing IC regulator Z401 and associated components T1102, CR401, C401, R401, R402, R403, and C402.

3. A 7.5kV power supply for the anode voltage supply. This power supply is a regulated positive 7.5kV 10mA DC source.

4. A 800V power supply for the GRID Trigger supply. This power supply is a regulated positive 800 volt DC source.

5. A 30V power supply for the power control relay circuitry. This power supply is an unregulated positive 30 volt DC source utilizing T202, CR202, and capacitors C402-C407.

6. A 18V power supply for the mosfet driver supply. This power supply is regulated, positive 18 volt DC source employing IC regulator Z403 and capacitor C413.

7. A 24V power supply for the front panel power lights and opto-isolation circuit. This power supply is regulated, positive 24 volt DC source employing IC regulator Z404 and and capacitor C409.

8. A 5.0VDC power supply for the control logic. This power supply is regulated, employing a voltage requlator Z407 and capacitor C413.

9. A -100VDC power supply for the GRID 2 bias of the Thyratron. This power supply is aregulated negative 100 volt DC source employing IC regulator Z406 and associated components T402, CR404, C414, R406, R407, R408,R409 and C415.

6 Coupler/Isolation Filter Section Refer to Figure-10 for the following circuit description. The coupler/isolation filter employs ceramic vacuum relays for

switching the surge injection and polarity. Depending on the front panel selected injection mode, the appropriate relay is activated by the microcontroller circuitry. K801 through K804 are used for injection modes and to direct the pulse to the HV output connectors J101 and J103. Pulse polarity can be controlled by grounding of the two output connectors with the ground plug provided with the unit. Relays K805 and K806 are used to couple the pulses through coupling capacitor networks (CN801 and CN802). Inductors L1001 and L1002 are used to block the pulses from being injected into the AC mains while allowing the AC power to get to the E.U.T. After the EUT AC power has been connected to J201, relays K201 and K202 switche the electrical connection from J201 to the coupler/isolation network. CB201 is a magnetic circuit breakers which limit the network current to 15A because of thermal heating in the isolation network. At J115, the E.U.T. is exposed to the AC power and the output pulse.

7 Thyratron and Pulse Forming Circuit These are not shown. Please see explanation in Section 3.1.

8 Digital Control Circuit The digital control circuits are comprised of these sections: the controller card (Figure-8), the logic mother board (Figure-9), the front panel board (Figure-10). The controller card's main function are reading the front panel push buttons, determining the required action, setting timing chips and relays to appropriate value and lastly updating the displays. The mother boards primary function is power distribution, signal routing, relay driving and trigger driving. The front panel board's primary function is refreshing discrete LED's, opto-coupling the push buttons to the logic supply level and creating the trigger pulse output.

9 Controller Card The controller card is controlled centrally by a micro-controller U1405 which contains the system software. The micro-controller accessed other chips using port C and U1413. Data from the front panel keyboard matrix is stored in U1414 and is read by U1405 after U1414 interrupts signaling a change on the front panel. U1407 and U1411 are timer chips which control the timing and are always running. U1406 sends data to control the output for either non-synchronized or line synchronized output, one shot, starting and stopping, and also HV-ON. The trigger output from U1401 goes to U1412 where it is gated by U1406. The signal from U1412 feeds from U1403B which drives the scope trigger and the grid driver circuits. U1401 and U1404 are decoding chips which read the data from R101, a digital pot, and translates it to a parallel out where U1405 (the micro-controller) can read the data. U1402 is a comparator which is used for the zero-crossing circuit which is fed to U1407 for line synchronization.

10 Logic Mother Board The logic mother board has multifunctions. Circuit designations U1301 and U1302A are used for creating a delay time between grid 1 and grid 2. U1307 and U1308 are outputs which drives the grid driver board on Figure-11. U1303, U1304, U1305 and U1306 are used to drive the instrument relays and there outputs are designated on the right side of the schematic. Connector J1301 and J1302 are in parallel for an additional plug-in card. J1303 and J1304 are for power distribution. J1302 and J1303 are for signal connections between the logic mother board and the front panel board.

11 Front Panel Board The front panel board has three main functions. The LED display are driven from the serial output from the controller card. Each chip, U1802-U1806, individually drives each display D1801-D1805. U1801 drives all the discrete LED's as directed by the controller card. The signals front the logic mother board which control the front panel lights are routed on this board for easy termination Z1801-Z1803 are opto-couplers which connect the front switches to the controller card. R101, the digital pot on the front panel, is plugged into connectors J1804 and J1805 where the signal is sent to the controller card. Q1801 and T1801 comprise the scope trigger function which has an isolated output.

Maintenance

1 Servicing Before attempting to service this instrument, study the circuit descriptions of Section 3.

2 Cooling The Model V-3113 utilizes convection cooling. A vent is on the bottom of the cabinet, the bottom and rear of the cabinet must be clear of obstructions.

3 Cabinet Removal Remove the four screws from the front panel (two on each side), and the four screws (two on each side) holding the rear mounting brackets to the chassis. Slide the instrument forward to clear the cabinet.

4 Top Cover Removal Remove the sixteen flathead screws. Removal of the top cover opens interlock switch S202.

5 Bottom Cover Removal Remove the sixteen flathead screws. Removal of the bottom cover opens interlock switch S201.

6 Cleaning Periodically inspect the instrument for dust accumulation. Clean with a vacuum cleaner or dry air under moderate pressure.

7 Panel Lights The Panel Lights; POWER ON, READY FOR TEST, and HV-ON, are replaceable from the front panel by snapping out the translucent cover from each light. Chicago miniature number 327, 28 volt bulbs are used. If any indicator light becomes dim, replace it to prevent the possibility of having high-voltage on in the absence of the red indicator lights. Panel lamp replacement may be facilitated by the use of a lamp tool (Microswitch type 15PA19 tool is recommended).

8 Fuse and Circuit Breakers A fuse is used to protect the instrument. The fuse is located on the rear panel of the instrument rated at 3 amps. In case this fuse blows, remove the fuse and replace it with a SLO-BLO 3A 250VAC fuse. If the fuse blows again consult a qualified service personnel for a diagnosis.

9 Interlocks Two interlocks are provided for safety, one on each of the chassis top and bottom covers.

10 Instrument Failure By carefully observing the symptoms and by referring to the schematic diagrams, most problems can be pinpointed quickly to a particular circuit. If a problem can't be solved, call the Velonex service department. Do not ship an instrument back without a Return Merchandise Authorization (RMA) number.

VELONEX

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Replaceable Parts List

The following lists the replaceable parts used in the Model V-3113 Surge Transient Generator. Circuit reference designations, where applicable, refer to the schematic diagrams in Section 6. Replacement parts should be ordered by specifying the entire Velonex part number.

1 Sub-Assemblies: (Unless otherwise specified all resistors are in ohms, 1/4 watt, +5%.)

STOCK #	DESCRIPITION	CIRCUIT DESIGNATION
900-PP60	ASSY, 650-1000 VDC HV PWR SP	PS202
900-21267	ASSY, CONTROLLER CARD	1400 SERIES
900-21236	ASSY, COUPLING INDUCTOR	L1001,L1002
900-21308	ASSY, FET TRIGGER BOARD	600 SERIES
900-21450	ASSY, FILTER BRD	1000 SERIES
900-21406	ASSY, FRONT PANEL	100 SERIES
900-21457	ASSY, FRONT PANEL CONTROL BRD	1800 SERIES
900-21353	ASSY, GROUND STRAP	200 SERIES
900-21247	ASSY, INDUCTOR CHARGING NETWRK	900 SERIES
900-21503	ASSY, LO VOLTGE POWER SUPPLIES	400 SERIES
900-21633	ASSY, LOGIC MOTHER BOARD	1300 SERIES
900-21340	ASSY, OPTION "S" PROGRAMMING	2300 SERIES
900-21369	ASSY, PROGRAMMING CARD	2400 SERIES
900-21369	ASSY, PROGRAMMING CARD	2400 SERIES
900-21235	ASSY, TRANSFORMER BOARD	1700 SERIES
900-21638	ASSY,FAN	B201
900-21553	ASSY,HV METER DISPLAY	M101
900-21196	ASSY,PLUG IN	100 SERIES

2 Resistors: (Unless otherwise specified all resistors are in ohms, 1/4 watt, +5%.)

STOCK #	DESCRIPITION	CIRCUIT DESIGNATION
094-0098	POTENTIOMETER, DIGITAL	R101, R102
091-0020.071	RES FIX COMP, 2.2K, 2W	R103-106(RN101,102)
091-0012.015	RES-CARB-COMP 10 OHMS, 1/2W	R301
091-0020.135	RES-CARB-COMP 1M OHM, 2W	R302-313
091-0020.103	RES-CARB-COMP, 47K, 2W	R401
091-0008.071	RES-CARB-COMP, 2.2K, 5%, 1/4W	R402
094-0094	POT, 1M	R403
091-0012.104	RES-CARB-COMP, 51K, 1/2W	R404, R407
091-0008.042	RES-CARB-COMP 130, 5%, 1/4W	R405
094-0102	POT, 2K, 1/4W	R406
091-0008.069	RES-CARB-COMP, 1.8K, 5%, 1/4W	R408
094-0115	POT, 200K, 1/4W	R409
091-0020.038	RES-CARB-COMP, 91, 2W	R410
092-0016	RES,WW,8K,5%,5W	R411
092-0031	RES-FIX-WW, 5KOHM, 14.5W	R501, R523
091-0020.047	RES-CARB-COMP, 220 OHM, 2W	R510-520*
091-0020.063	RES-CARB-COMP, 1K OHM, 2W	R521,R522
091-0020.078	RES-CARB-COMP, 4.3K OHM, 2W	R524-527*, R502-509*
091-0020.056	RES-CARB-COMP, 510 OHM, 2W	R528-532*
093-0097	RES-SMD, 75 OHMS, 1%	R601-603
091-0020.027	RES-FIX-COMP, 33 OHM, 2W, 5%	R701-R708
091-0020.024	RES-FIX-COMP, 24 OHM, 2W, 5%	R709-R711
091-0020.084	RES-CARB-COMP, 7.5K OHMS, 2W	R901-911
094-0112	RES-WW, 2 OHM, 10W, 5%	R1101
091-0008.039	RES-CARB-COMP, 100, 1/4W	R1301
091-0008.056	RES-CARB-COMP, 510, 1/4W	R1302
094-0101	TRIM POT, 50K	R1303
094-0104	RES-VAR-TRIMPOT, 1K	R1304
091-0008.111	RES-COMP, 100K, 1/4W	R1401
091-0008.079	RES-COMP, 4.7K, 1/4W	R1402, 1405
091-0008.087	RES-COMP, 10K, 1/4W	R1403, 1404, 1411
091-0008.105	RES-COMP, 56K, 1/4W	R1406
091-0008.056	RES-COMP, 510, 1/4W	R1407
091-0008.075	RES-COMP, 3.3K, 1/4W	R1408
091-0008.133	RES-COMP, 820K, 1/4W	R1409
091-0020.015	RES-CARB-COMP, 100HMS, 2W	R1601
091-0020.135	RES-CARB-COMP, 1MOHM, 2W	R1602-1605
091-0008.075	RES-CARB-COMP 3.3K, 5%, 1/4W	R1801,1802,1807,1816,1826
091-0008.039	RES-CARB-COMP, 100, 5%, 1/4W	R1803-1806
091-0008.062	RES-CARB-COMP, 910, 5%, 1/4W	R1808-1811
091-0008.087	RES-CARB-COMP 10K, 5%, 1/4W	R1812-1815
091-0008.065	RES-CARB-COMP, 1.2K, 5%, 1/4W	R1817-1820, 1827
091-0008.047	RES-CARB-COMP 220, 5%, 1/4W	R1821,1822,1828-1832
091-0008.032	RES-CARB-COMP 51, 5%, 1/4W	R1824
091-0008.036	RES-CARB-COMP 75, 5%, 1/4W	R1825
091-0008-063	RES-CARB-COMP 1K, 5%, 1/4W	R1833, R1823
091-0008.051	RES-CARB-COMP 330, 5%, 1/4W	R1834
091-0008.055	RES-CARB-COMP 470, 5%, 1/4W	R1835
091-0016.099	RES-CARB-COMP, 33K, 1W	R1901
094-0093	POTENTIOMETER, 50K	R1902
091-0020.135	RES-CARB-COMP, 1M, 2W	R1903-1912
093-0075	RES-CARB-COMP, 1M, SMD	R2301
093-0094	RES-CARB-COMP, 10K, SMD	R2302
091-0008.094	RES, COMP, 20K, 1/4W, 5%	R2401
091-0008.087	RES, COMP, 10K, 1/4W, 5%	R2402
	RESISTOR PACK	RP2301

2 Capacitors: (All values in æf, +20%, except where otherwise noted.)

STOCK #	DESCRIPITION	CIRCUIT DESIGNATION
102-0020	CAP-FOIL, 400V, .22	C1001,1002
101-0055	CAP FIX CERM 10PF, 1KV, 10%	C101-104 (CN101,102)
102-0095	CAP-EXT-FOIL, 0.5uF, 1000VDC	C301, 302
105-0124	CAP-LYTIC, 1000uF, 35V	C401, 402, 407
105-0132	CAP-LYTIC, 470uF, 63V	C403, 404
105-0059	CAP, ELECT, 250uF, 150V	C405, 406
105-0136	CAP FIX LYTIC 330000 MFD,15VDC	C408
102-0087	CAP-FOIL, 0.1uF, 1KV	C501, C507, C514
103-0026	CAP-MICA, 500pF, 1500V	C508-512*
103-0023	CAP-MICA, 250pF, 1500V	C513*
101-0002.029	CAP-CER, 0.05uF, 500V, 20%	C515,516*
101-0074	CAP-CER, 1uF, 50V	C601, 604, 605, 608
101-0075	CAP-CER, 0.1uF, 50V	C602, 603, 606, 607
105-0108	CAP-LYTIC, 22uF, 63V	C609-612
103-0031	MICA-CER, 20pF, 3kV, 5%	C701
101-0077	CAP-CER, 470 pF, 10kV	C703, C704, C705
101-0005	CAPACITOR, 0.01uF, 3KV	C801-806*
105-0133	CAP-LYTIC, 1000uF, 63V	C1101-1102
103-0001.027	CAP, MICA, 100pF, 500V	C1301-1303, C1310
101-0047	CAP,CERAMIC, 0.1uF, 50V	C1304-1308,C1311,C1313-131
105-0122	CAP-LYTIC, 100uF, 16V	C1309
105-0137	CAP-FIX-LYTIC, 100uF, 50V	C1312
105-0108	CAP-FIX-LYTIC, 22uF, 63V	C1315
101-0066	CAP-CER, 0.01uF, 50V	C1401-5,8,9,11-15,17,19-25,27
104-0006.039	CAP-TANT, 6.8uF, 35V	C1406,1407,1426
101-0047	CAP-CER, 0.1uF, 50V	C1416
106-0020	CAP-FIX-OIL, 0.5uF, 3000VDC	C1601
106-0060	CAP-FIX-OIL, 2.0uF, 7.5KV	C1602
101-0066	CAP,CERAMIC, 0.01UF, 50V	C1801-1808,C1810-1811
103-0001.035	CAP-FIX-MICA 220 PF, 500V	C1809
104-0031	CAP-CER, 0.01uF, SMD	C2301, C2102, C2304, C2305
104-0029	CAP-TANT, 6.8uF, SMD	C2303, C2306
101-0066	CAP, CER 0.01uF, 50V	C2401-C2402
104-0006.039	CAP, TANT, 6.8uF, 35V	C2403

3 Diodes:

STOCK #	DESCRIPITION	CIRCUIT DESIGNATION
111-0197	LED, GREEN "START"	CR101
111-0198	LED, YELLOW, INJECTION MODE	CR102, 103, 104
111-0192	LEDS, AMBER DIFFUSED	CR105, 106
111-0069	DIODE, BRIDGE	CR401,402
111-0127	DIODE, 4kV, 250mA	CR701, CR702
111-0214	DIODE, FAST RECOVERY	CR801-812
111-0219	DIODE, ULTRA-FAST 1000V	CR813-816
111-0003	DIODE, SIGNAL	CR1401,1402
111-0062	DIODE, SILICON 1A 200V	CR1501
111-0127	DIODE	CR1601-1604
111-0003	DIODE	CR1801

4 Transistors:

STOCK #	DESCRIPITION	CIRCUIT DESIGNATION
112-0151	TRANSISTOR	Q601
112-0150	TRANSISTOR	Q602
112-0001	TRANSISTOR, NPN	Q1801

5 Switches:

STOCK #	DESCRIPITION	CIRCUIT DESIGNATION
131-0003	SWITCH, DPDT MOMENT	S101, 102
131-0103	SWITCH, PUSH BTTN, SPDT MOMENT	S103-106,109-112,114,116
131-0105	SWITCH, SP3T	S107, 108, 117
131-0006	INTERLOCKS, TOP & BOTTOM	S201, S202
131-0001	SWITCH, DPDT, POWER	S118
131-0122	DIP SWITCH	S2301

6 Transformers:

STOCK #	DESCRIPITION	CIRCUIT DESIGNATION
900-21545	XFMR, 12V @ 8A ASSY	T201/P402
900-21546	XFMR, 100VA, 115/230 PRI	T202/P403
900-21333	TRANSFORMER, PULSE	T601
900-21429**	BROAD BAND TRANSFORMER	T801
142-0140	XFMR, 60V, .16ASEC, 115/230PRI	T1101
142-0146	XFMR, 8.0V, 1.25ASEC, 115/230P	T1102
142-0014	TRANSFORMER,110/220 - 12/14	T1701
900-3349	TRANSFORMER,PULSE	T1801

7 Panel Lamps:

STOCK #	DESCRIPITION	CIRCUIT DESIGNATION
280-0009	LAMPS, 28V, 0.04A	I101-108

8 Integrated Circuits:

STOCK #	DESCRIPITION	CIRCUIT DESIGNATION
113-0096	IC,DUAL MONOSTABLE	U1301
113-0104	IC, HEX INVERTER	U1302, U1309
113-0119	IC,RELAY DRIVER,4A,80V	U1303-1304,U1306
113-0165	IC,OCTAL 3-STATE LATCH	U1305
113-0150	IC,FET DRIVER,6A PK	U1307-1308
113-0181	REGULATOR +12V	U1310
113-0122	IC, HP QUAD DEC/CT, 16 PIN	U1401,1404
113-0097	IC, COMPARATOR	U1402
113-0096	IC, MONOSTABLE, 16 PIN	U1403
113-0171	MICROCONTROLLER, 8 BIT, 40 PIN	U1405
113-0165	IC, HEX, 3-STATE LATCH, 20 PIN	U1406
113-0169	IC,COUNTER/TIMER, 10MHZ, 24PIN	U1407,1411
113-0116	IC, HEX INVERTER, 14 PIN	U1408, 1409
113-0100	IC, QUAD OR GATES, 14 PIN	U1410
113-0095	IC, QUAD AND GATES, 14 PIN	U1412
113-0118	IC, 8-BIT DECODER, 16 PIN	U1413
113-0170	IC,KEYBOARD/DISPLAY INT,40 PIN	U1414
113-0165	OCTAL, 3 STATE LATCH	U1801
113-0153	IC,MULTIPLE LED DISPLAY DRIVER	U1802,U1805,U1806
113-0174	IC, GPIB INTERFACE, SMD	U2301
113-0175	IC, INTERFACE TRANCEIVER, SMD	U2302
113-0176	IC, INTERFACE TRANCEIVER, SMD	U2303
113-0177	IC, DATA BUFFER, SMD	U2304
113-0178	IC, HCMOS I/O BUFFER	U2401
113-0116	IC, INVERTER, 14 PIN	U2402
113-0167	IC,CRYSTAL OSCILLATOR TTL,2MHZ	X1401
113-0168	IC,CRYSTAL OSCILLATR TTL,10MHZ	X1402
113-0167	CRYSTAL OSCILLATOR TTL, 2MHZ	X2301
113-0154	REGULATOR	Z401
113-0101	REGULATOR	Z402
113-0155	REGULATOR	Z403
113-0172	IC, SMD, CMOS PWR MOSFET DRIVR	Z601
113-0156	IC, QUAD OPTO-ISOLATOR	Z1801-1803
113-0179	IC, 8-BIT D/A	Z2401
113-0131	IC, OP-AMP	Z2402

9 Relays:

STOCK #	DESCRIPITION	CIRCUIT DESIGNATION
132-0070	RELAY, HIGH CURRENT 40A	K201,K202
132-0068	RELAY, SPDT, 5KV, 26.5V	K801-804
132-0044	RELAY, SPST, NC, 10KV, 26.5V	K805-806

10 Inductors:

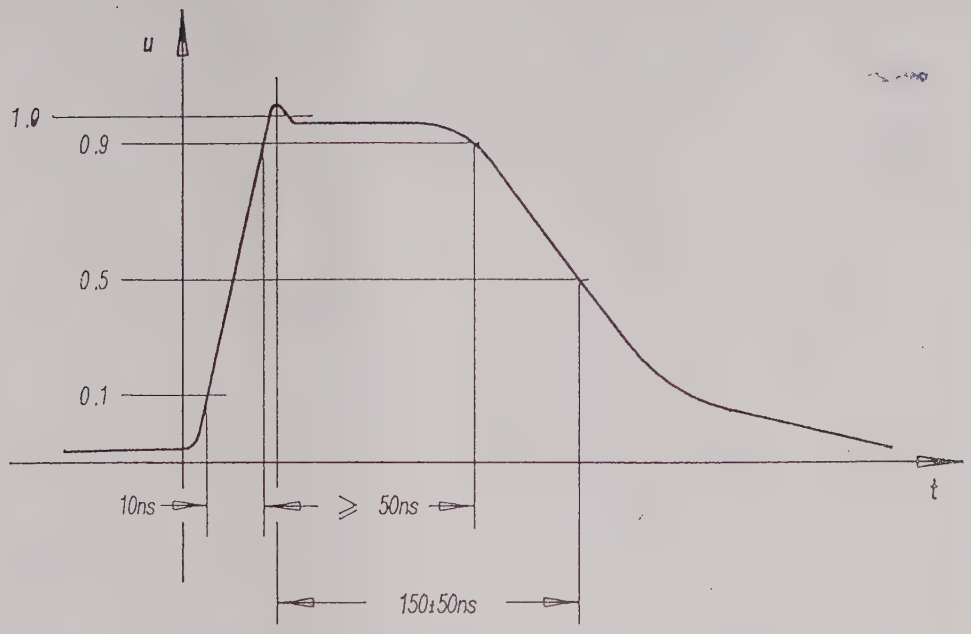
STOCK #	DESCRIPITION	CIRCUIT DESIGNATION
142-0143	INDUCTOR, 4H, 90mA	L901
141-0031	INDUCTOR, 390uH, +/- 10%, SMD	L2301
037-0033	INDUCTOR NETWORK	LN201, LN202
037-0033	INDUCTOR NETWORK	LN701 - LN704
037-0037	INDUCTOR NETWORK	LN801, LN802

11 Miscellaneous:

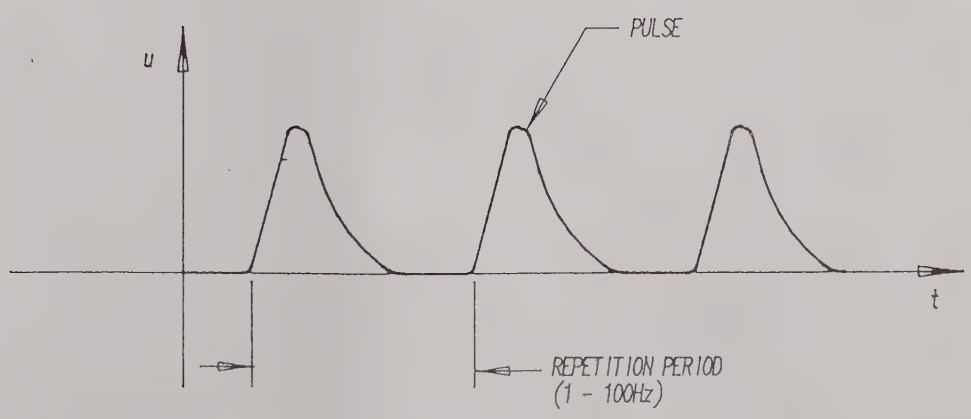
STOCK #	DESCRIPITION	CIRCUIT DESIGNATION
270-0039	CIRCUIT BREAKER, 277VAC, 15A	CB201
150-0034.001	GROUND POST	
150-0034.002	GROUND, KNURL NUT	
170-0068	HANDLE 7 INCH	
V-3379	PLUG, 125V, 15A, 3 PRONG	
V-3378	PLUG, 277V, 15A,	
053-0008	POWER CORD, 125V, 10A	
IM-223	V-3113 INSTRUCTION MANUAL	
280-0009	LAMPS, 28V, 0.04A	I101-108
150-0335	CONNECTOR, HN	J101, J103
150-0098	BNC CONNECTOR	J102
150-0345	CONNECTOR, MINIATURE RECEPTCLE	J104
150-0325	FLANGED INLET	J201
150-0362	HV OUTPUT CONNECTOR	P101
900-21458	SHORTING PLUG	P103
900-21628	PLUG,FEMALE MICROPHONE	P104
150-0323	CONNECTOR, 227V, 15A	P203

Illustrations

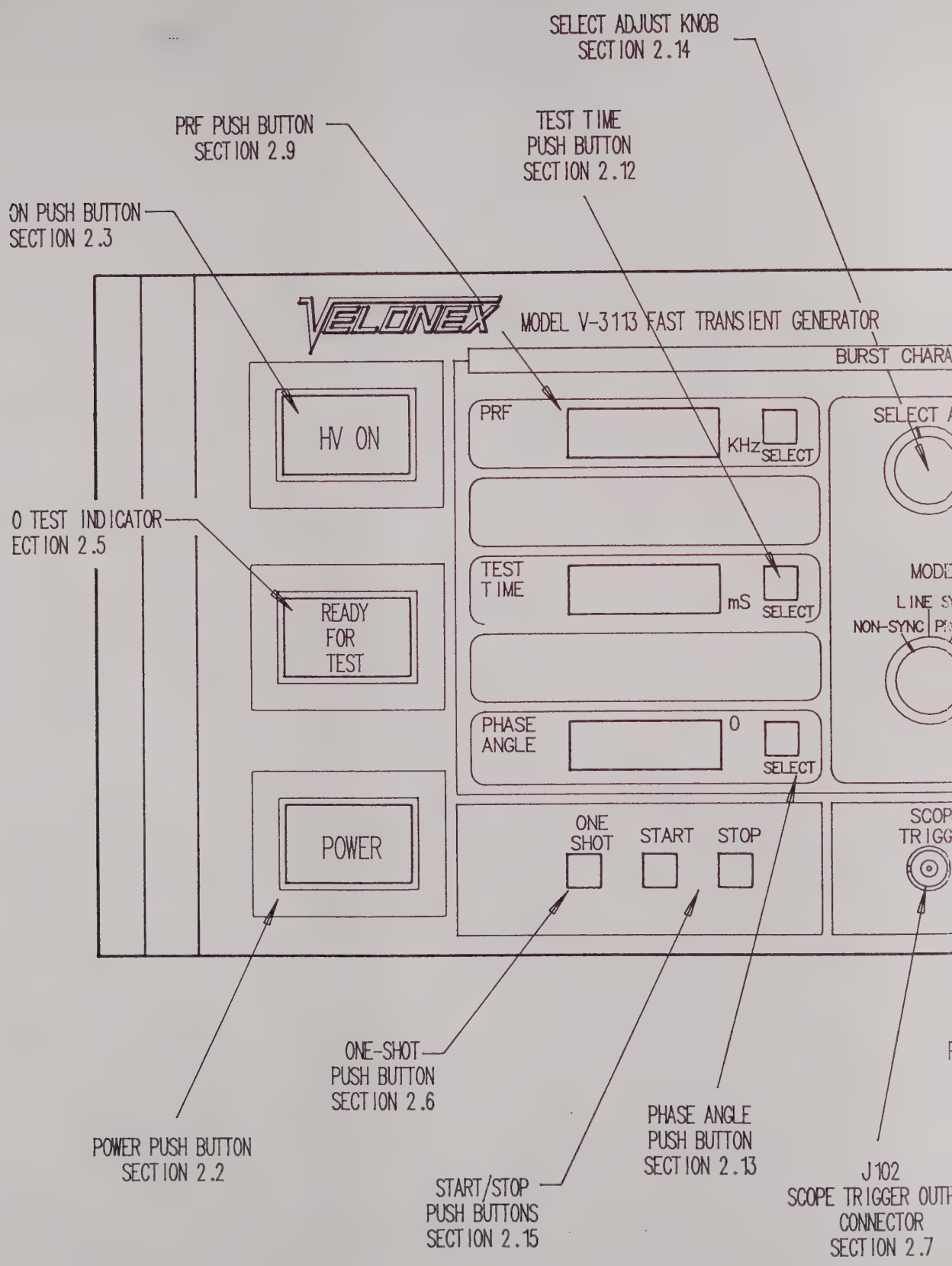
429576

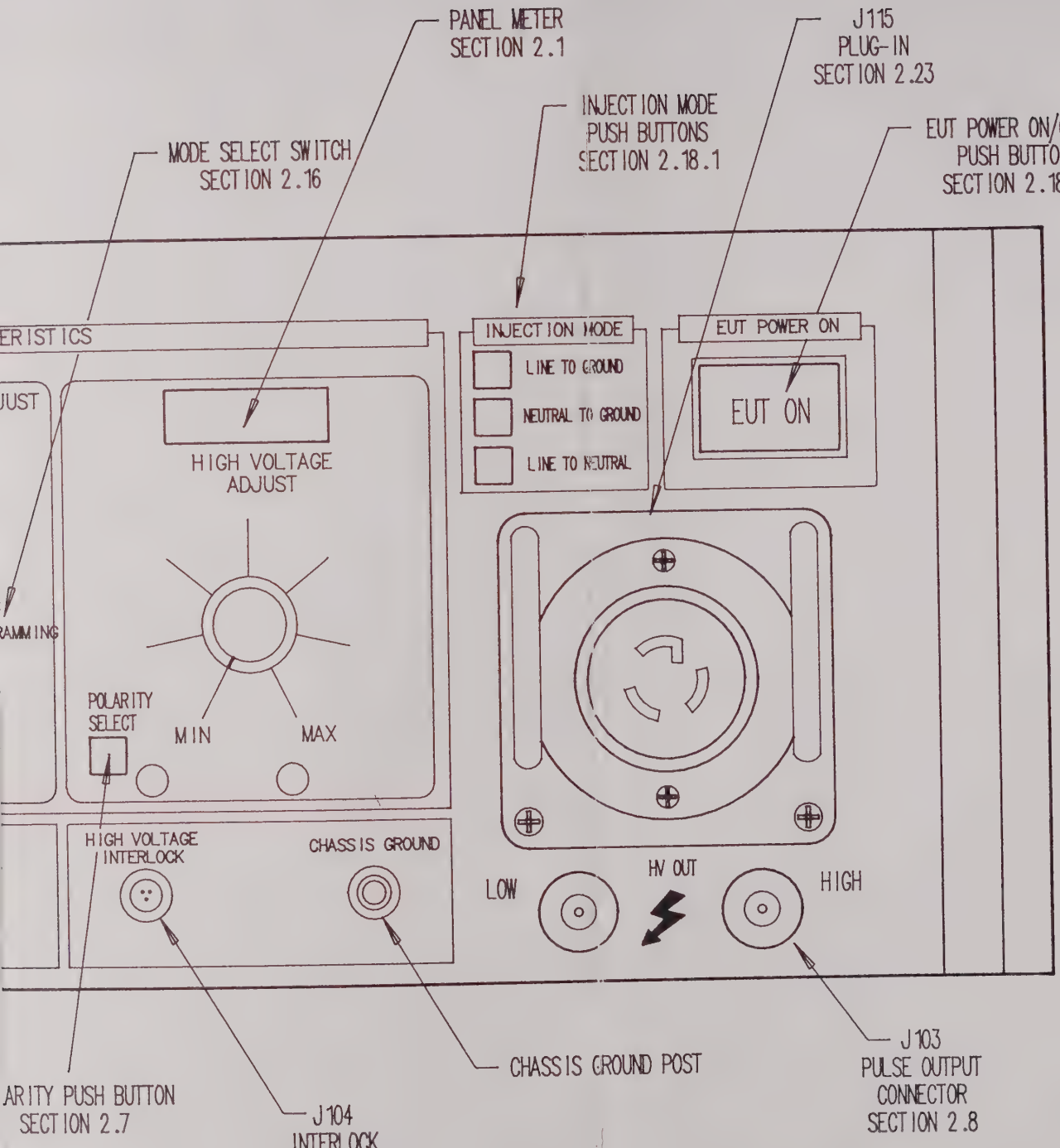


WAVESHAPE OF A SINGLE PULSE OPEN CIRCUIT
FIGURE 6.1A



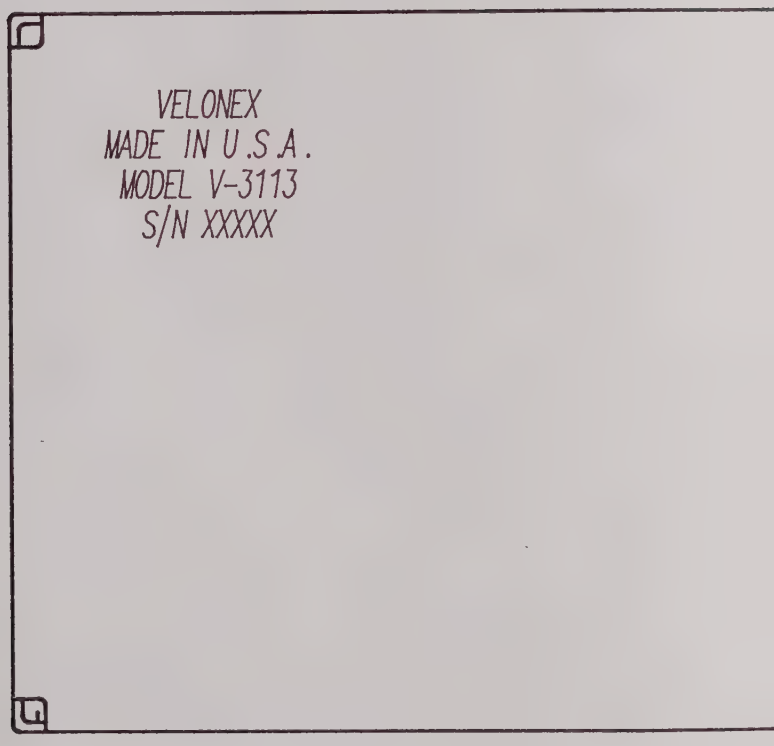
WAVESHAPE SHOWING REPETITION PERIOD
FIGURE 6.1B

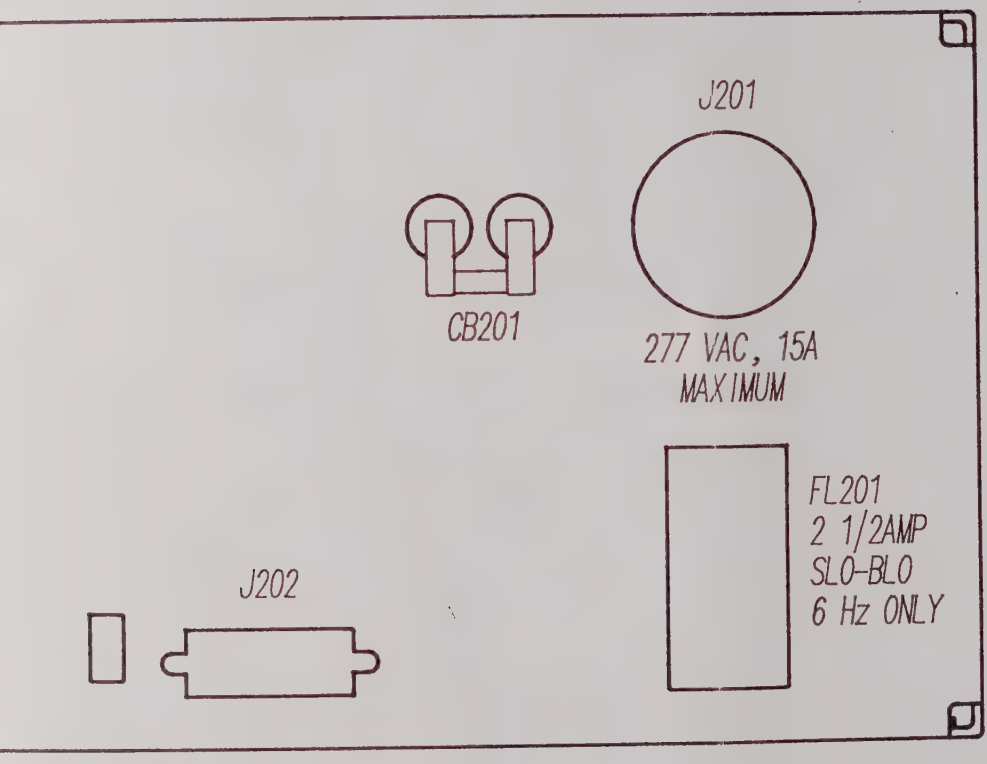

SELECT ADJUST KNOB
SECTION 2.14
PRF PUSH BUTTON
SECTION 2.9
TEST TIME
PUSH BUTTON
SECTION 2.12
ON PUSH BUTTON
SECTION 2.3
VELONEX
MODEL V-3113 FAST TRANSIENT GENERATOR
BURST CHARA
HV ON
PRF
KHz
SELECT
SELECT A
O TEST INDICATOR
ECTION 2.5
READY
FOR
TEST
TEST
TIME
mS
SELECT
MODE
LINE SY
NON-SYNC
PHASE
ANGLE
0
SELECT
POWER
ONE
SHOT
START
STOP
SCOP
TRIGG
ONE-SHOT
PUSH BUTTON
SECTION 2.6
POWER PUSH BUTTON
SECTION 2.2
PHASE ANGLE
PUSH BUTTON
SECTION 2.13
START/STOP
PUSH BUTTONS
SECTION 2.15
J102
SCOPE TRIGGER OUTP
CONNECTOR
SECTION 2.7



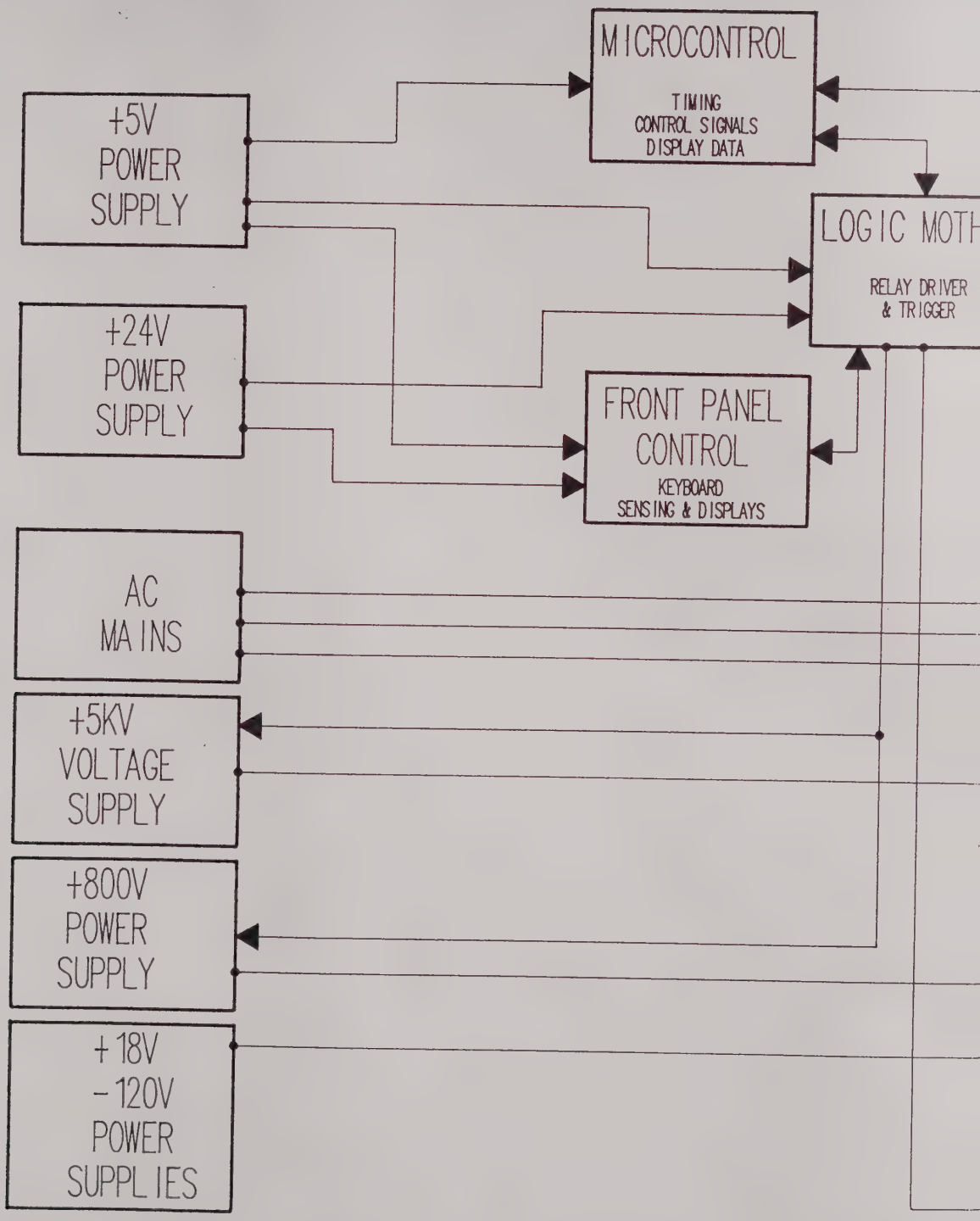
MODEL V-3113
FIGURE-6.2
FRONT PANEL CONTROLS

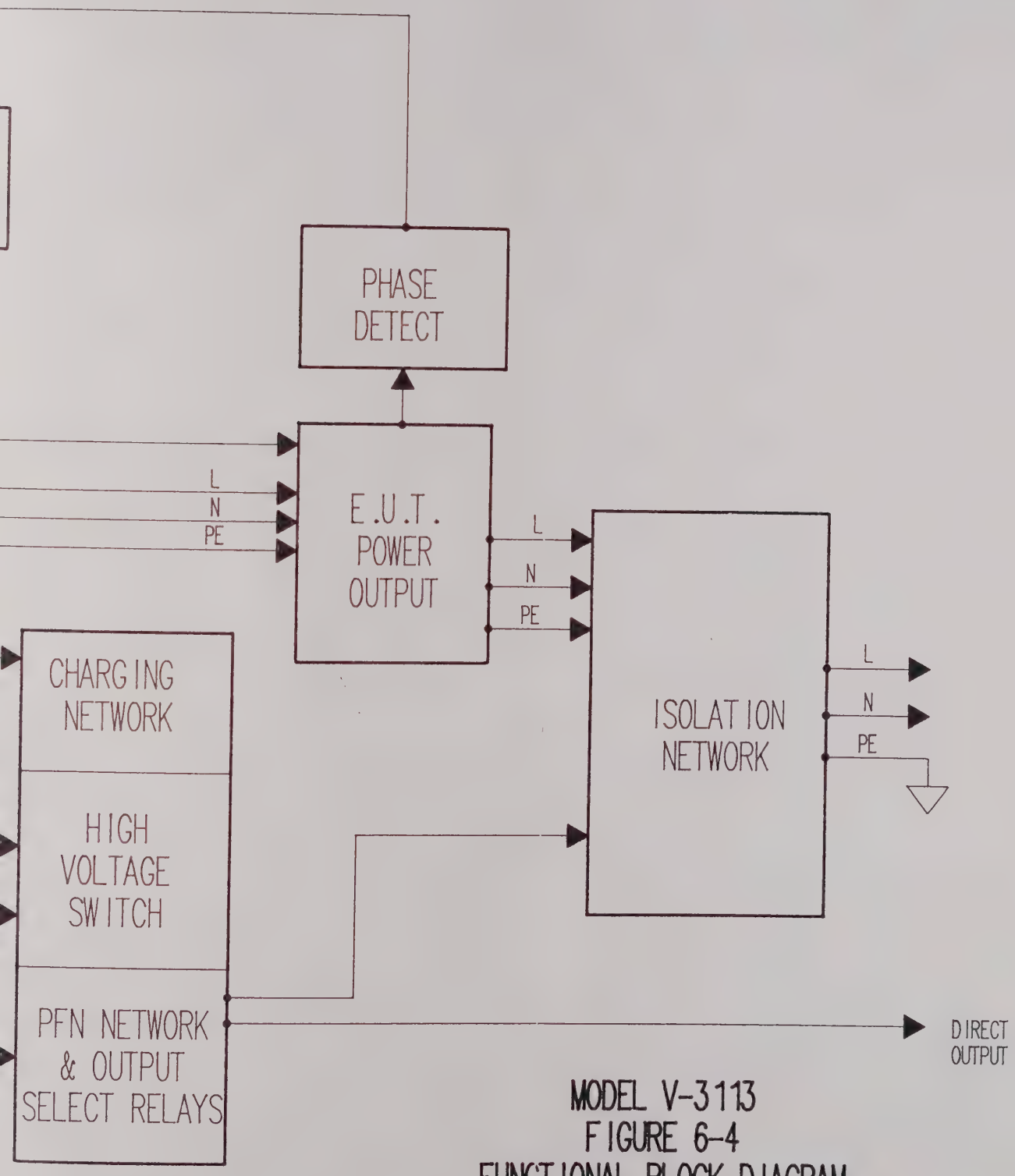
3/91


VELONEX
MADE IN U.S.A.
MODEL V-3113
S/N XXXXX



VELONEX
MODEL V-3113
REAR CHASSIS DISPLAY
FIGURE 6-3


MICROCONTROL
TIMING
CONTROL SIGNALS
DISPLAY DATA
+5V
POWER
SUPPLY
LOGIC MOTH
RELAY DRIVER
& TRIGGER
+24V
POWER
SUPPLY
FRONT PANEL
CONTROL
KEYBOARD
SENSING & DISPLAYS
AC
MAINS
+5KV
VOLTAGE
SUPPLY
+800V
POWER
SUPPLY
+18V
-120V
POWER
SUPPLIES



MODEL V-3113
FIGURE 6-4
FUNCTIONAL BLOCK DIAGRAM

FIGURE-6A

V3113 CONTROL BOARD LOGIC

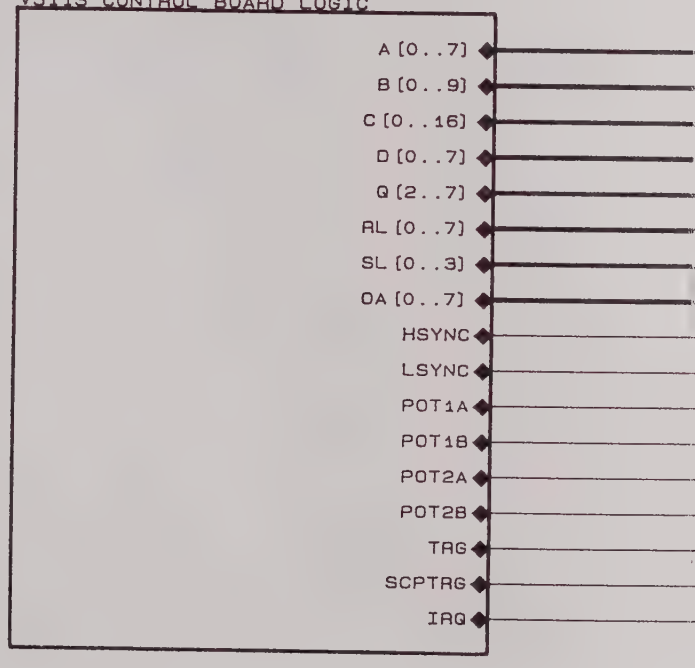
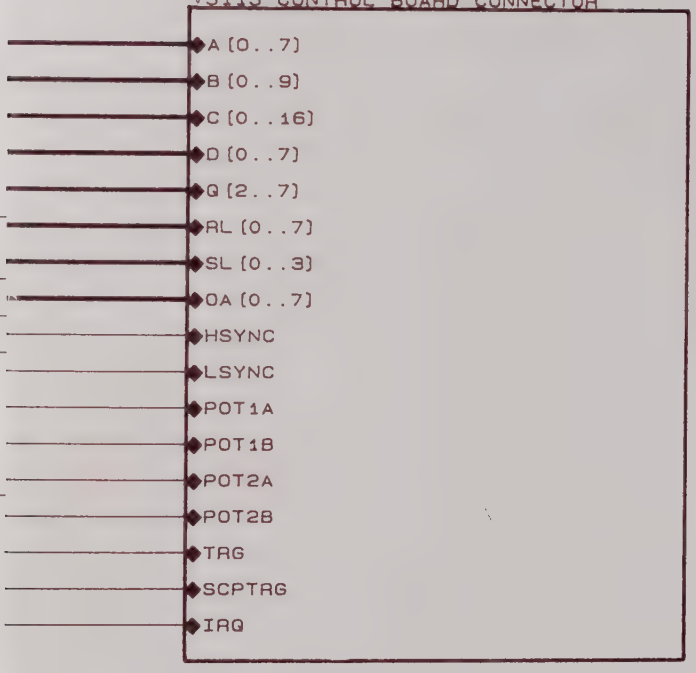


FIGURE-6B

V3113 CONTROL BOARD CONNECTOR

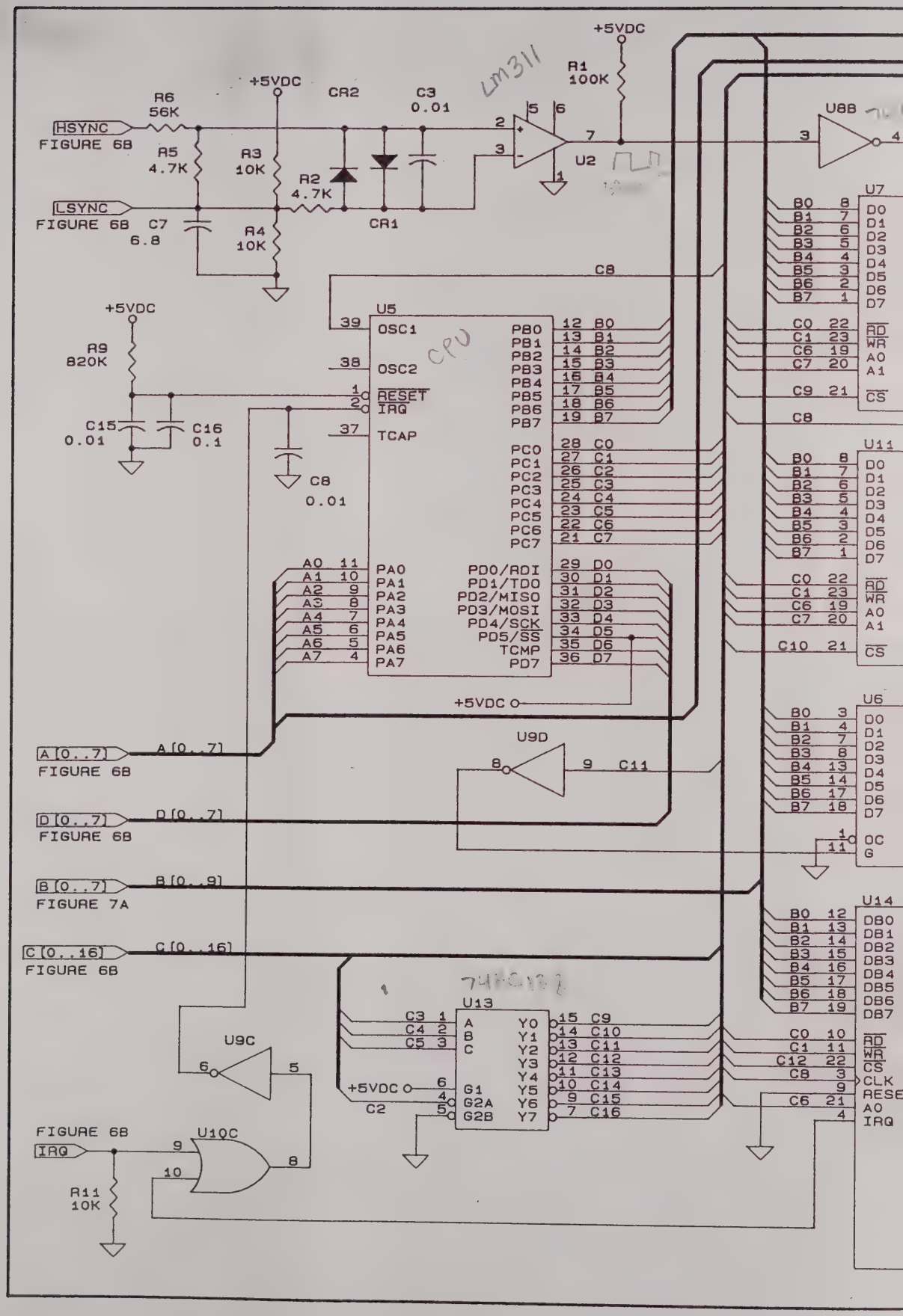


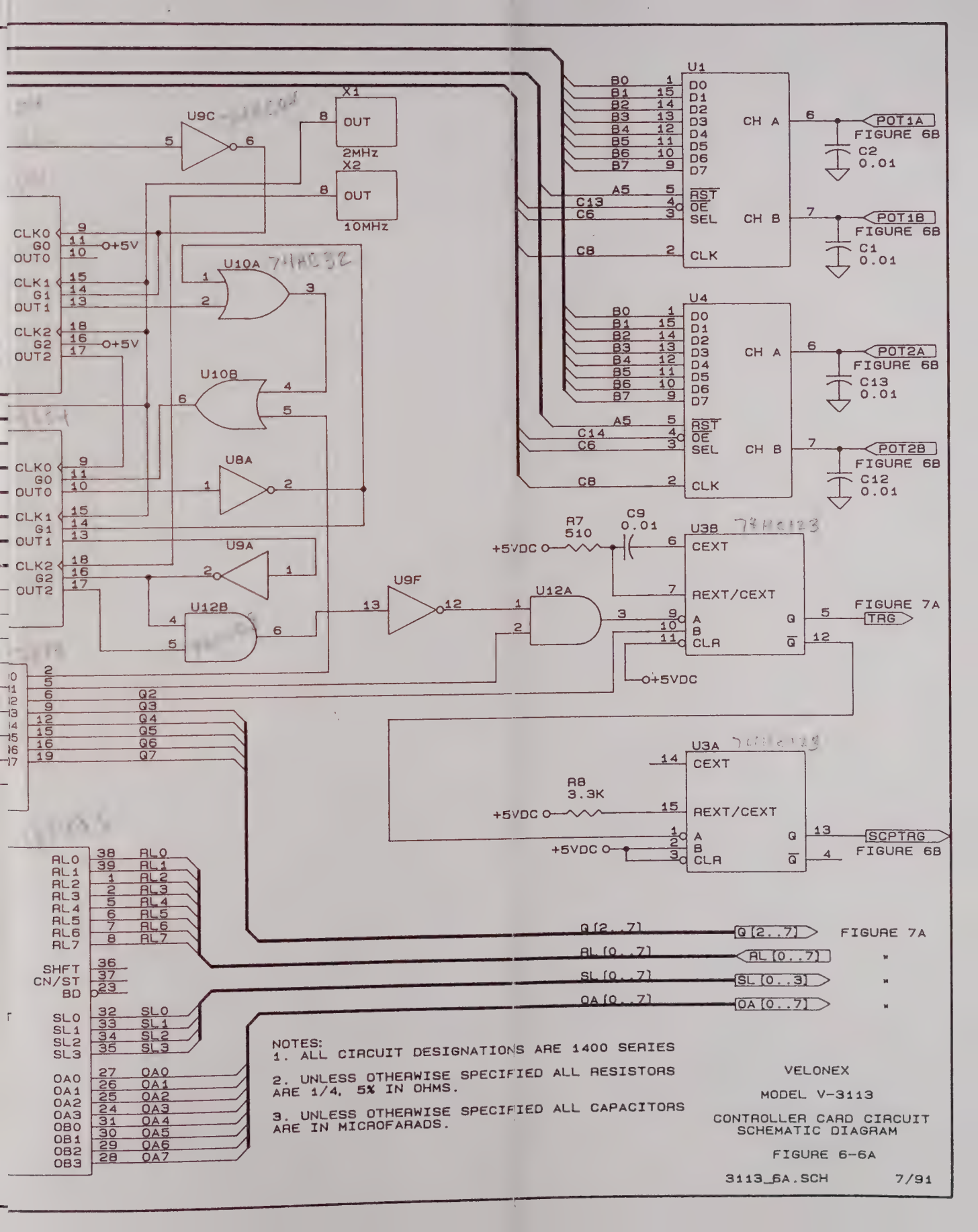
VELONEX

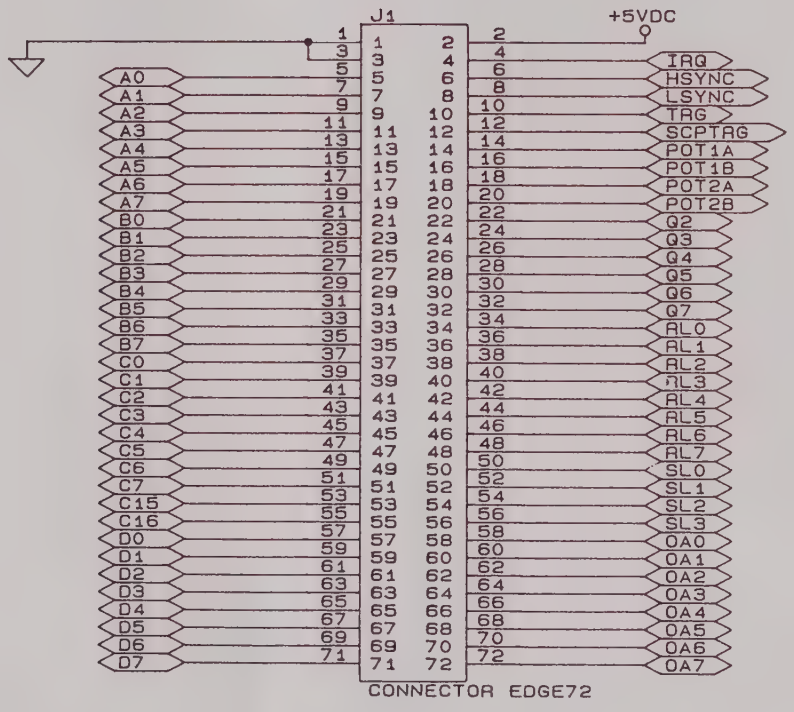
MODEL V-3113

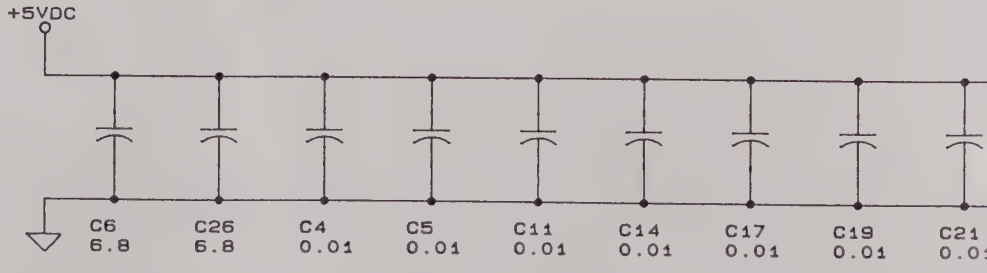
CONTROLLER CARD
SCHEMATIC DIAGRAM

FIGURE 6-6


+5VDC
R1
100K
LM311
U8B
+5VDC
R6
56K
CR2
C3
0.01
HSYNC
FIGURE 6B
R5
4.7K
R3
10K
R2
4.7K
U2
LSYNC
FIGURE 6B
C7
6.8
R4
10K
CR1
U7
C8
+5VDC
U5
R9
820K
39
OSC1
CPU
38
OSC2
1
RESET
2
IRQ
37
TCAP
C15
0.01
C16
0.1
C8
0.01
PB0
PB1
PB2
PB3
PB4
PB5
PB6
PB7
PC0
PC1
PC2
PC3
PC4
PC5
PC6
PC7
PA0
PA1
PA2
PA3
PA4
PA5
PA6
PA7
PD0/RDI
PD1/TDO
PD2/MISO
PD3/MOSI
PD4/SCK
PD5/SS
TCMP
PD7
+5VDC
U11
U6
A[0..7]
FIGURE 6B
U9D
C11
D[0..7]
FIGURE 6B
B[0..7]
FIGURE 7A
B[0..9]
C[0..16]
FIGURE 6B
C[0..16]
U14
DB0
DB1
DB2
DB3
DB4
DB5
DB6
DB7
74HC138
U13
U9C
FIGURE 6B
IRQ
U10C
R11
10K
+5VDC
C2
G1
G2A
G2B
Y0
Y1
Y2
Y3
Y4
Y5
Y6
Y7
RD
WR
CS
CLK
RESE
AO
IRQ


U1
U4
U9C
U10A 74HC32
U10B
U8A
U9A
U12B
U9F
U12A
U3B 74HC123
U3A 74HC123
X1
2MHz
X2
10MHz
+5V
+5VDC
R7 510
C9 0.01
R8 3.3K
CH A
CH B
POT1A
POT1B
POT2A
POT2B
FIGURE 6B
C2 0.01
C1 0.01
C13 0.01
C12 0.01
FIGURE 7A
TRG
SCPTRG
Q[2..7]
AL[0..7]
SL[0..3]
OA[0..7]
SHFT CN/ST
BD
NOTES:
1. ALL CIRCUIT DESIGNATIONS ARE 1400 SERIES
2. UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE 1/4, 5% IN OHMS.
3. UNLESS OTHERWISE SPECIFIED ALL CAPACITORS ARE IN MICROFARADS.
VELONEX
MODEL V-3113
CONTROLLER CARD CIRCUIT SCHEMATIC DIAGRAM
FIGURE 6-6A
3113_6A.SCH 7/91

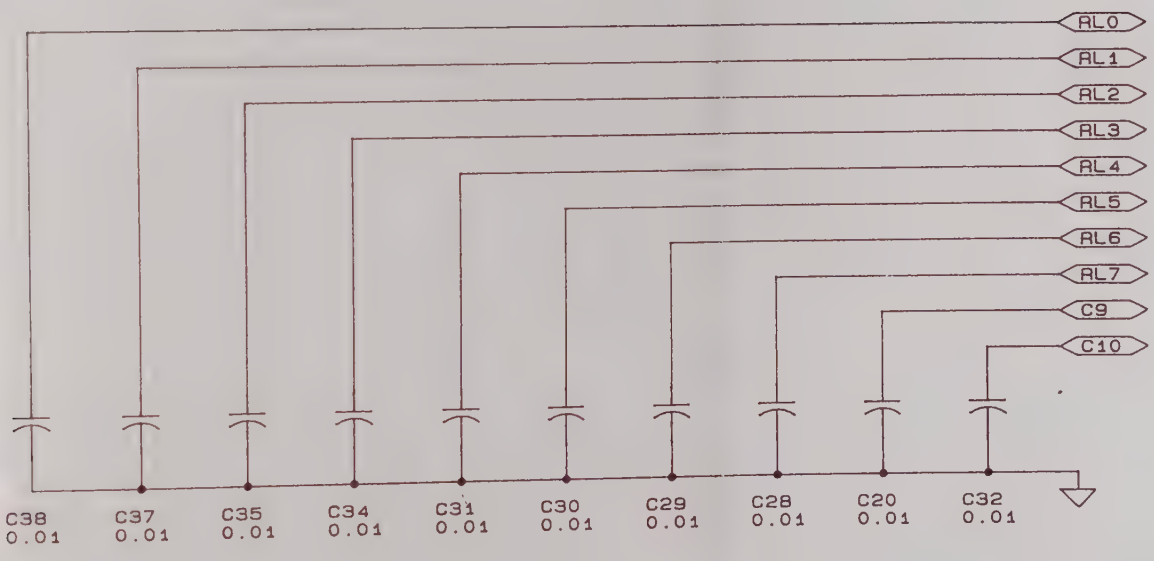


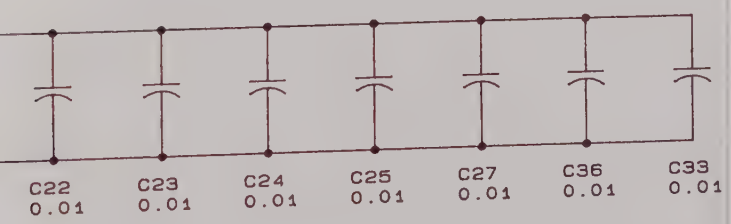


NOTE:
1. ALL CIRCUIT DESIGNATIONS ARE 1400 SERIES.

2. UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE 1/4W, 5% IN OHMS.

3. UNLESS OTHERWISE SPECIFIED ALL CAPACITORS ARE 20% IN MICROFARADS.





VELONEX

MODEL V-3113

CONTROL CARD CONNECTOR
SCHEMATIC DIAGRAM

FIGURE 6-68

3113_68.SCH 7/91

FIGURE-7A

LOGIC MOTHER BOARD CIRCUIT

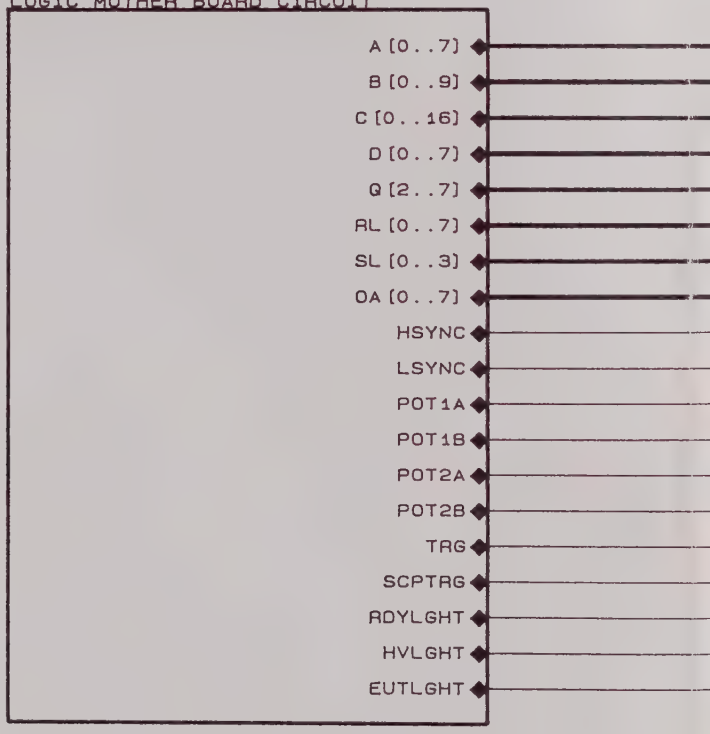
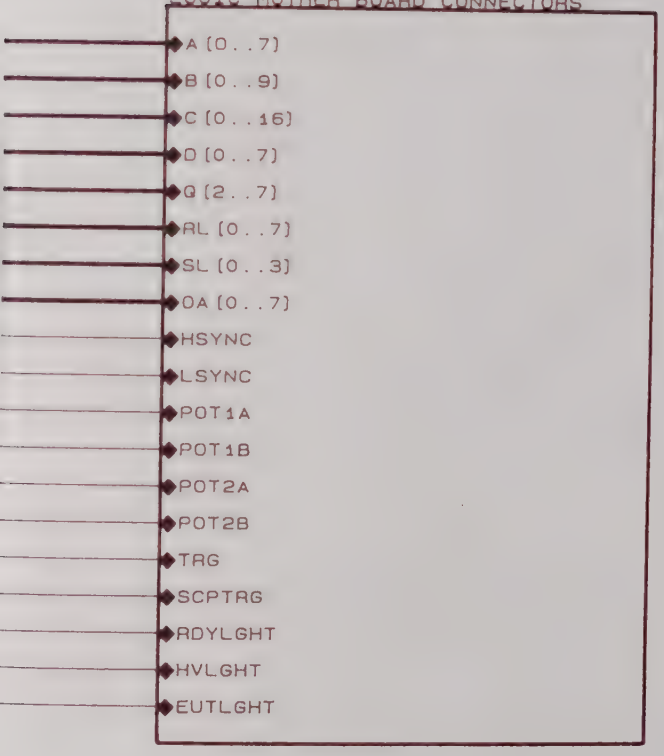


FIGURE-7B

LOGIC MOTHER BOARD CONNECTORS



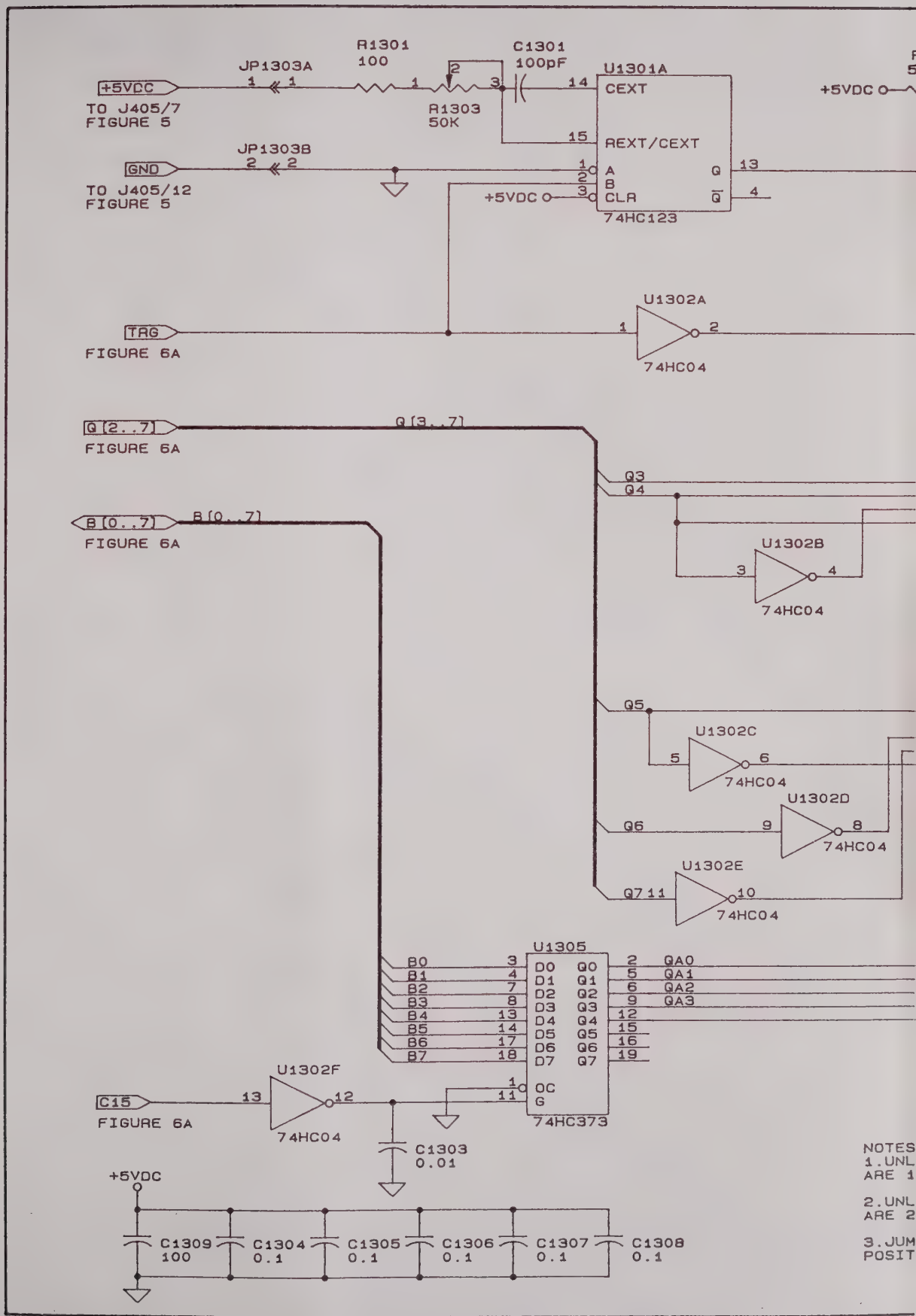
VELONEX

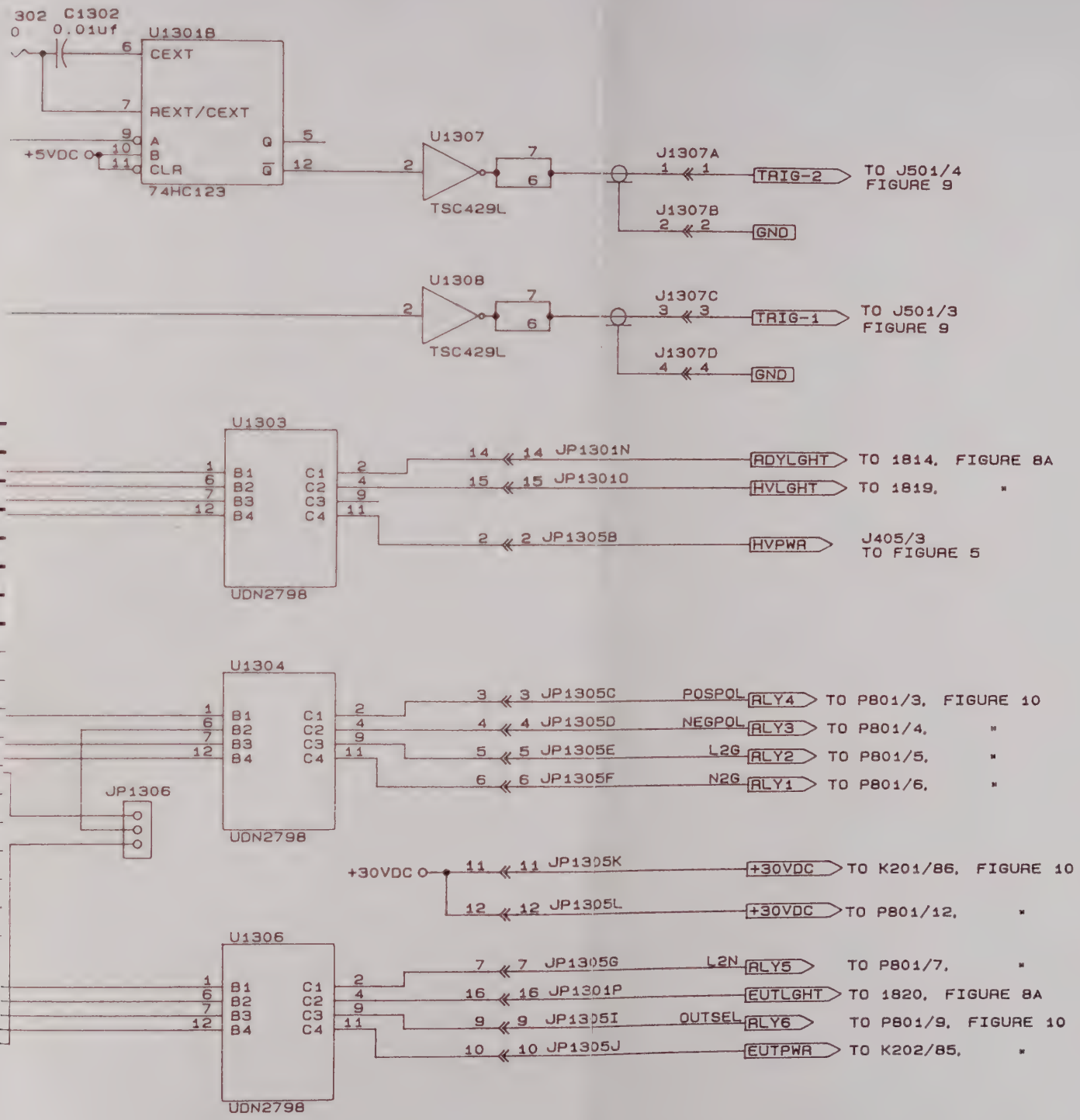
MODEL V-3113

LOGIC MOTHER BOARD
SCHEMATIC DIAGRAM

FIGURE 6-7

3113_7.SCH 7/91


JP1303A
R1301
100
C1301
100pF
U1301A
+5VDC
TO J405/7
FIGURE 5
R1303
50K
CEXT
REXT/CEXT
JP1303B
GND
TO J405/12
FIGURE 5
A
B
CLR
Q
74HC123
U1302A
TRG
FIGURE 6A
74HC04
Q[2..7]
FIGURE 6A
Q[3..7]
Q3
Q4
B[0..7]
FIGURE 6A
U1302B
74HC04
Q5
U1302C
74HC04
U1302D
Q6
74HC04
U1302E
Q7
74HC04
U1305
B0
B1
B2
B3
B4
B5
B6
B7
D0
D1
D2
D3
D4
D5
D6
D7
Q0
Q1
Q2
Q3
Q4
Q5
Q6
Q7
QA0
QA1
QA2
QA3
OC
G
74HC373
U1302F
C15
FIGURE 6A
74HC04
C1303
0.01
+5VDC
C1309
100
C1304
0.1
C1305
0.1
C1306
0.1
C1307
0.1
C1308
0.1
NOTES
1.UNL
ARE 1
2.UNL
ARE 2
3.JUM
POSIT



ESS OTHERWISE SPECIFIED ALL RESISTORS
/4W, 5%, IN OHMS.

ESS OTHERWISE SPECIFIED ALL CAPACITORS
0% IN MICROFARDS

PER IN POSITION "A" FOR V-3300 AND
ION "B" FOR V-3113.

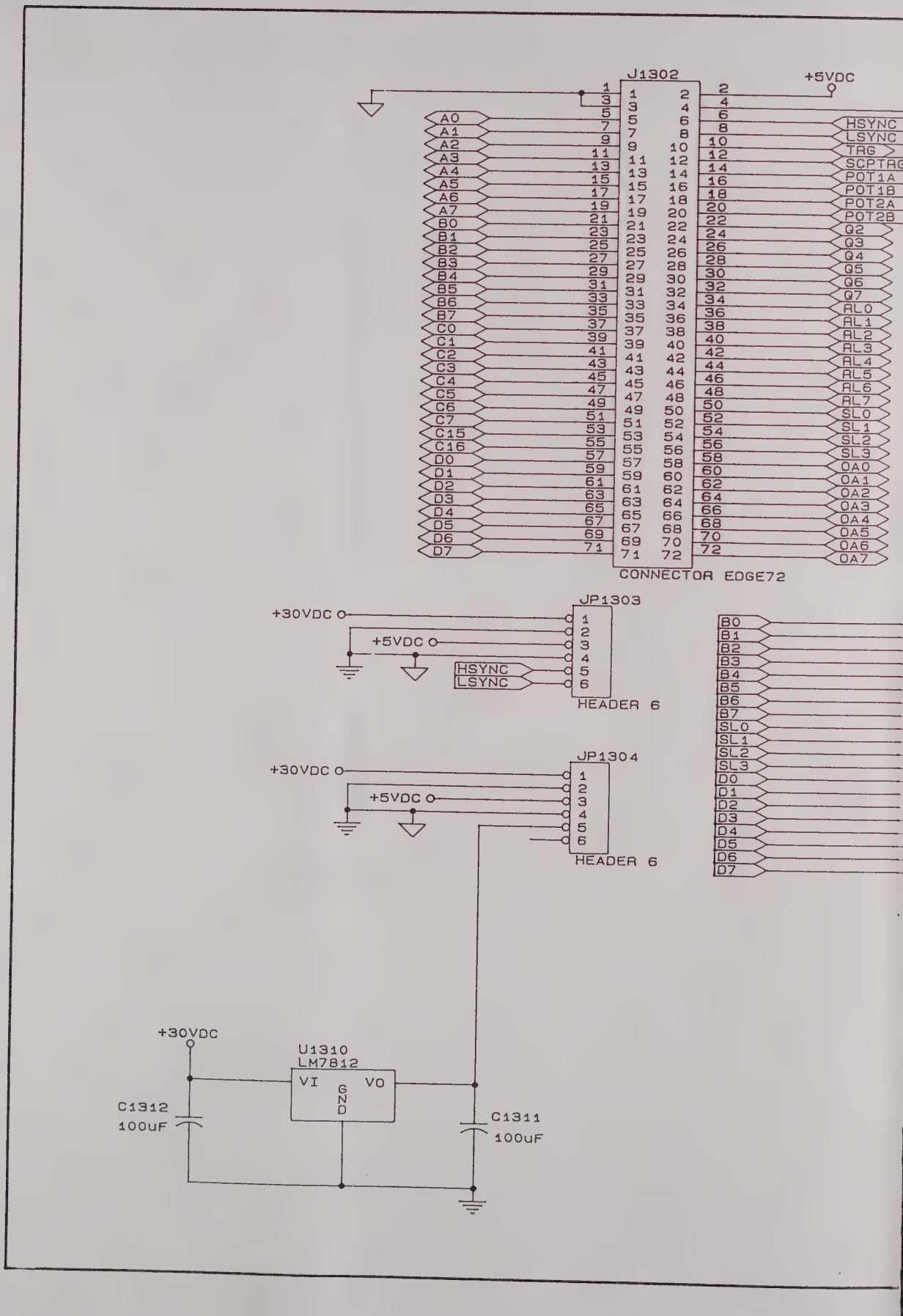
VELONEX

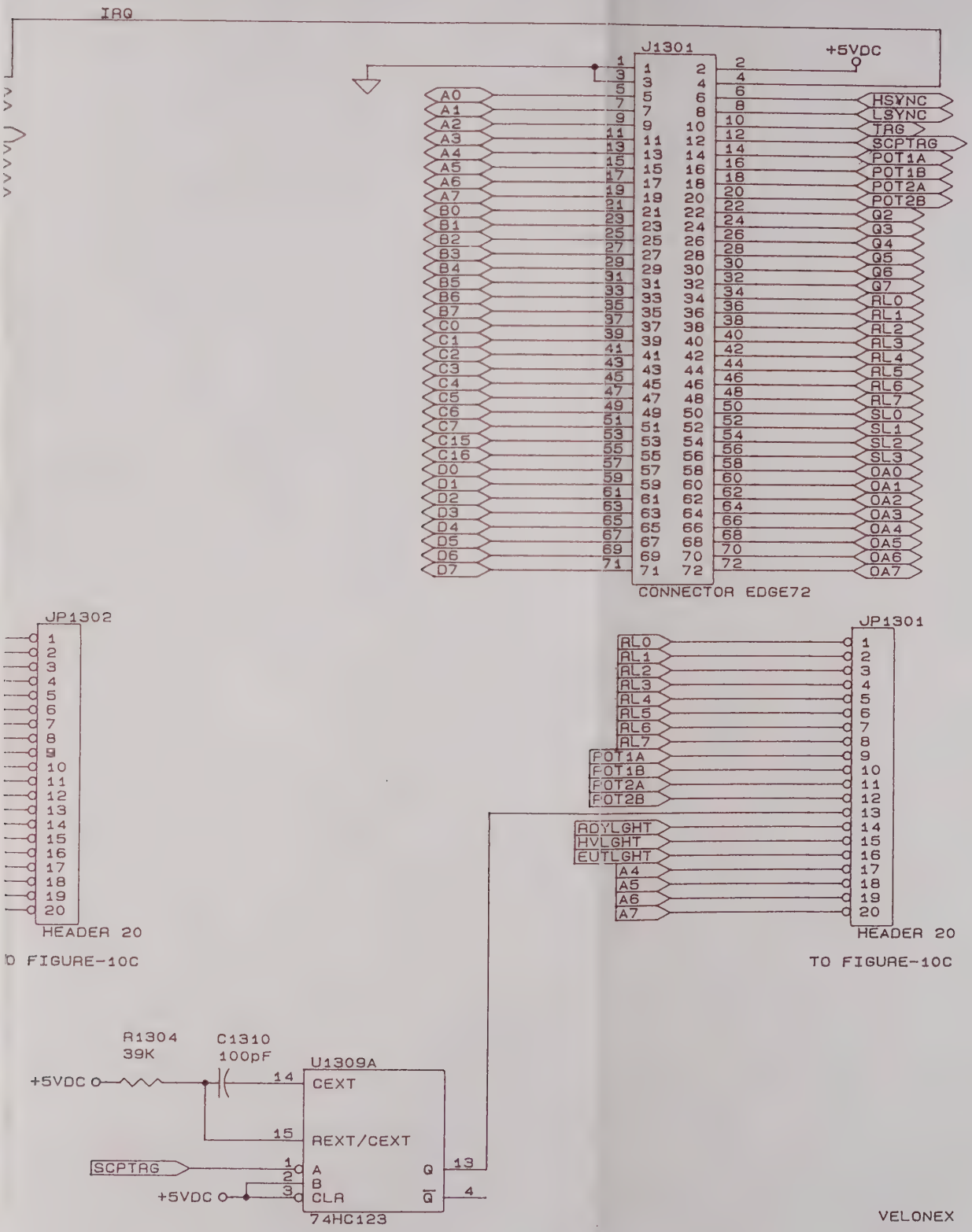
MODEL V-3113

LOGIC MOTHER BOARD CIRCUIT
SCHEMATIC DIAGRAM

FIGURE 6-7A

3113_7A.SCH 10/92


J1302
+5VDC
A0
A1
A2
A3
A4
A5
A6
A7
B0
B1
B2
B3
B4
B5
B6
B7
C0
C1
C2
C3
C4
C5
C6
C7
C15
C16
D0
D1
D2
D3
D4
D5
D6
D7
HSYNC
LSYNC
TRG
SCPTRG
POT1A
POT1B
POT2A
POT2B
Q2
Q3
Q4
Q5
Q6
Q7
RL0
RL1
RL2
RL3
RL4
RL5
RL6
RL7
SL0
SL1
SL2
SL3
OA0
OA1
OA2
OA3
OA4
OA5
OA6
OA7
CONNECTOR EDGE72
JP1303
+30VDC
+5VDC
HSYNC
LSYNC
HEADER 6
JP1304
+30VDC
+5VDC
HEADER 6
B0
B1
B2
B3
B4
B5
B6
B7
SL0
SL1
SL2
SL3
D0
D1
D2
D3
D4
D5
D6
D7
+30VDC
U1310
LM7812
VI
GND
VO
C1312
100uF
C1311
100uF



VELONEX

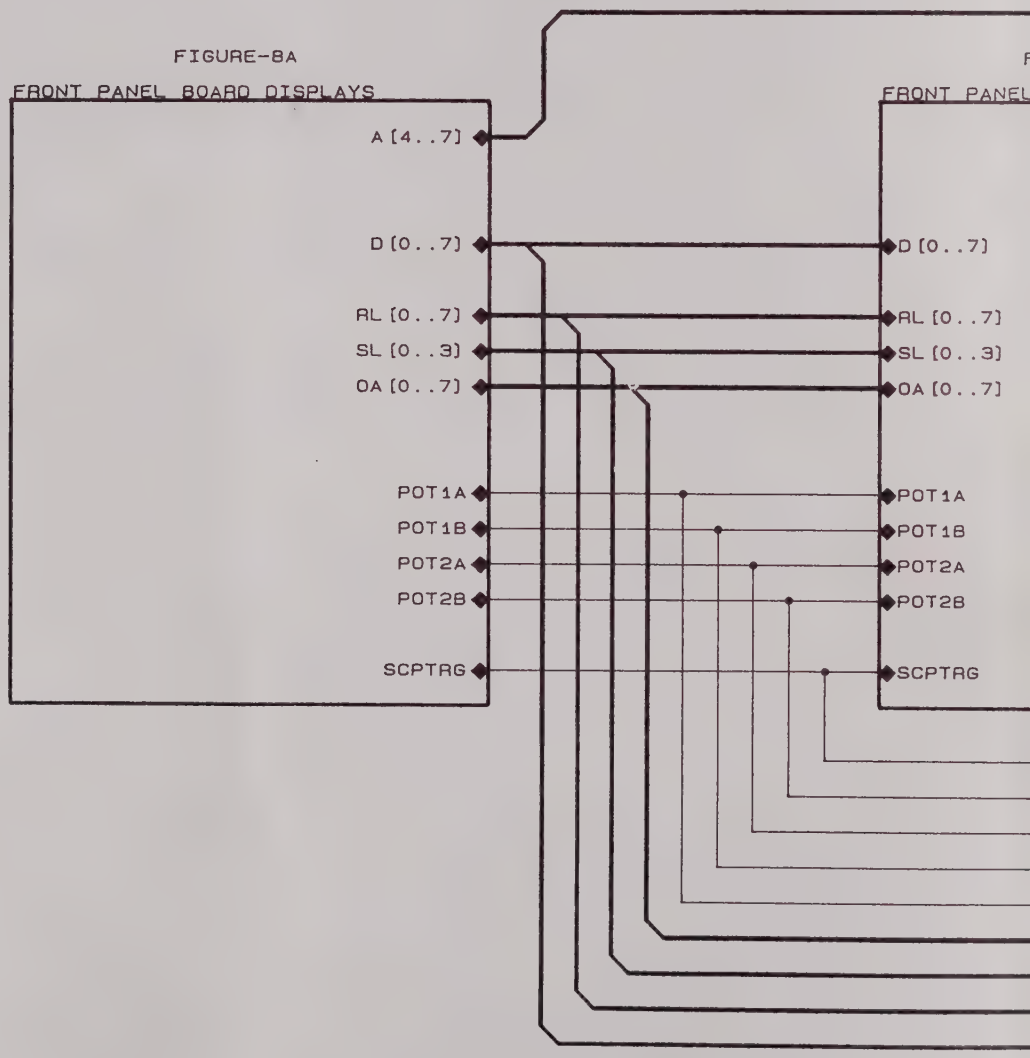
MODEL V-3113

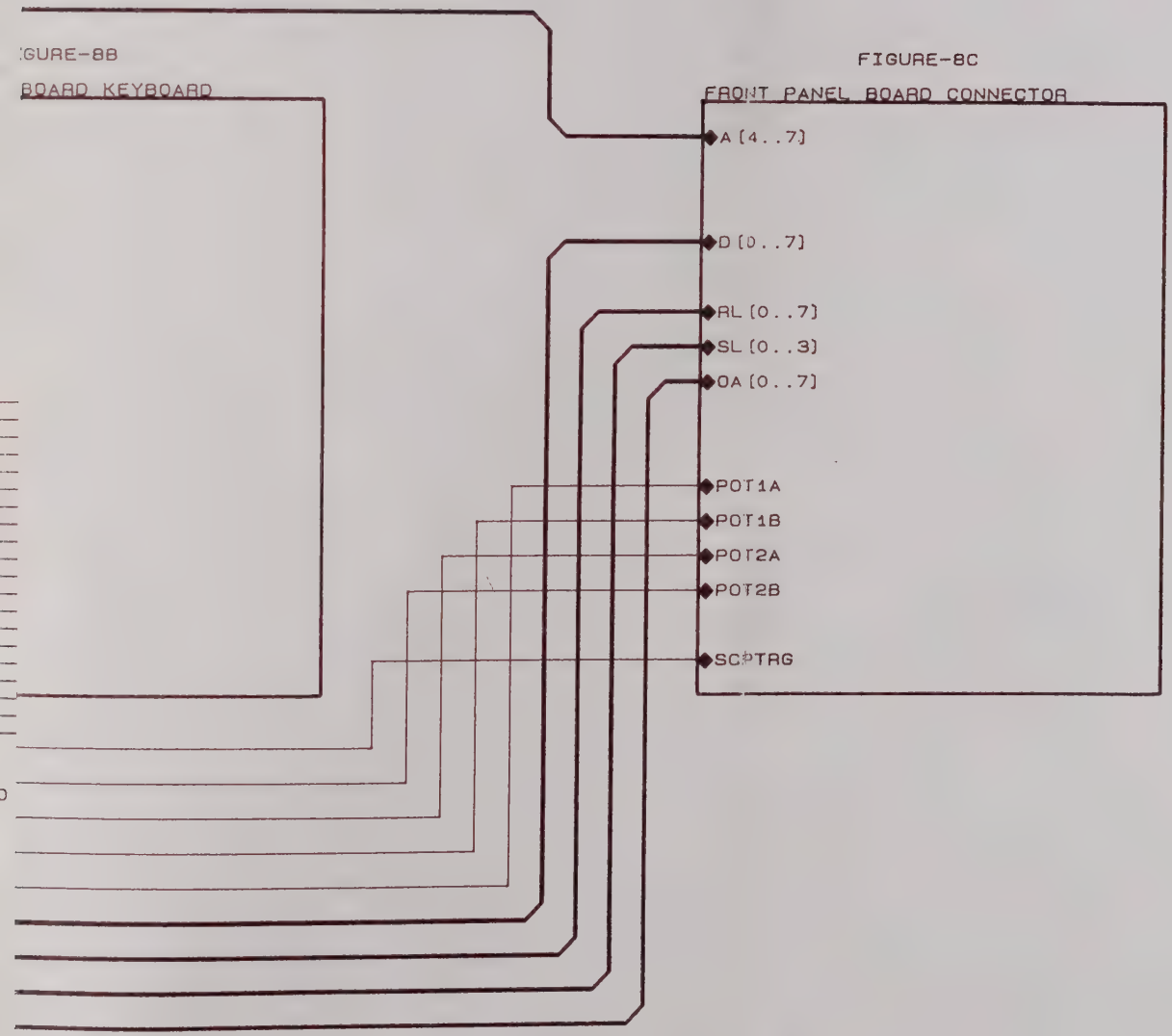
LOGIC MOTHER BOARD CONNECTORS
SCHEMATIC DIAGRAM

FIGURE 6-7B

3113_7B.SCH 7/91

FIGURE-8A


FRONT PANEL BOARD DISPLAYS
A [4..7]
D [0..7]
RL [0..7]
SL [0..3]
OA [0..7]
POT1A
POT1B
POT2A
POT2B
SCPTRG
D [0..7]
RL [0..7]
SL [0..3]
OA [0..7]
POT1A
POT1B
POT2A
POT2B
SCPTRG



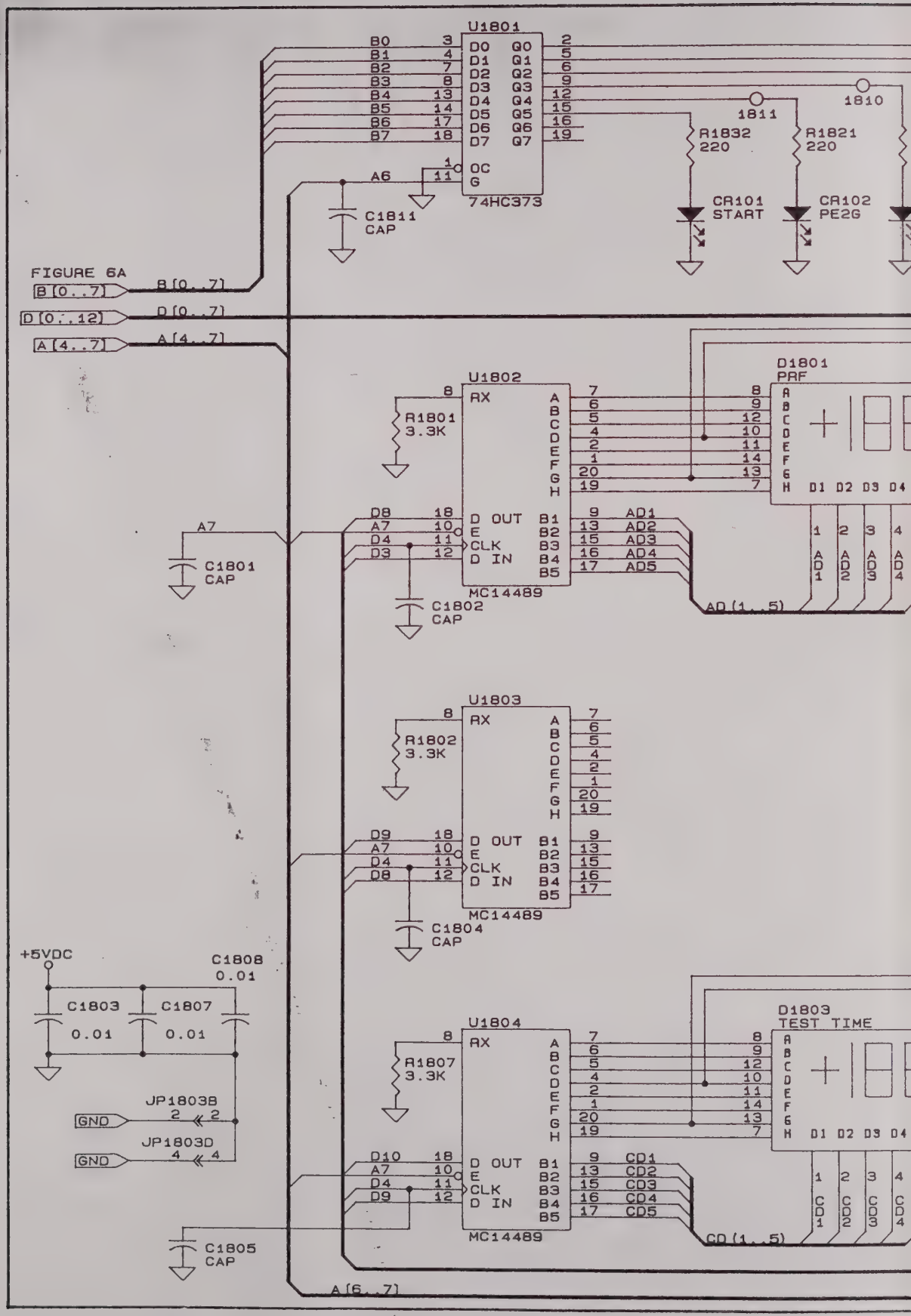
VELONEX

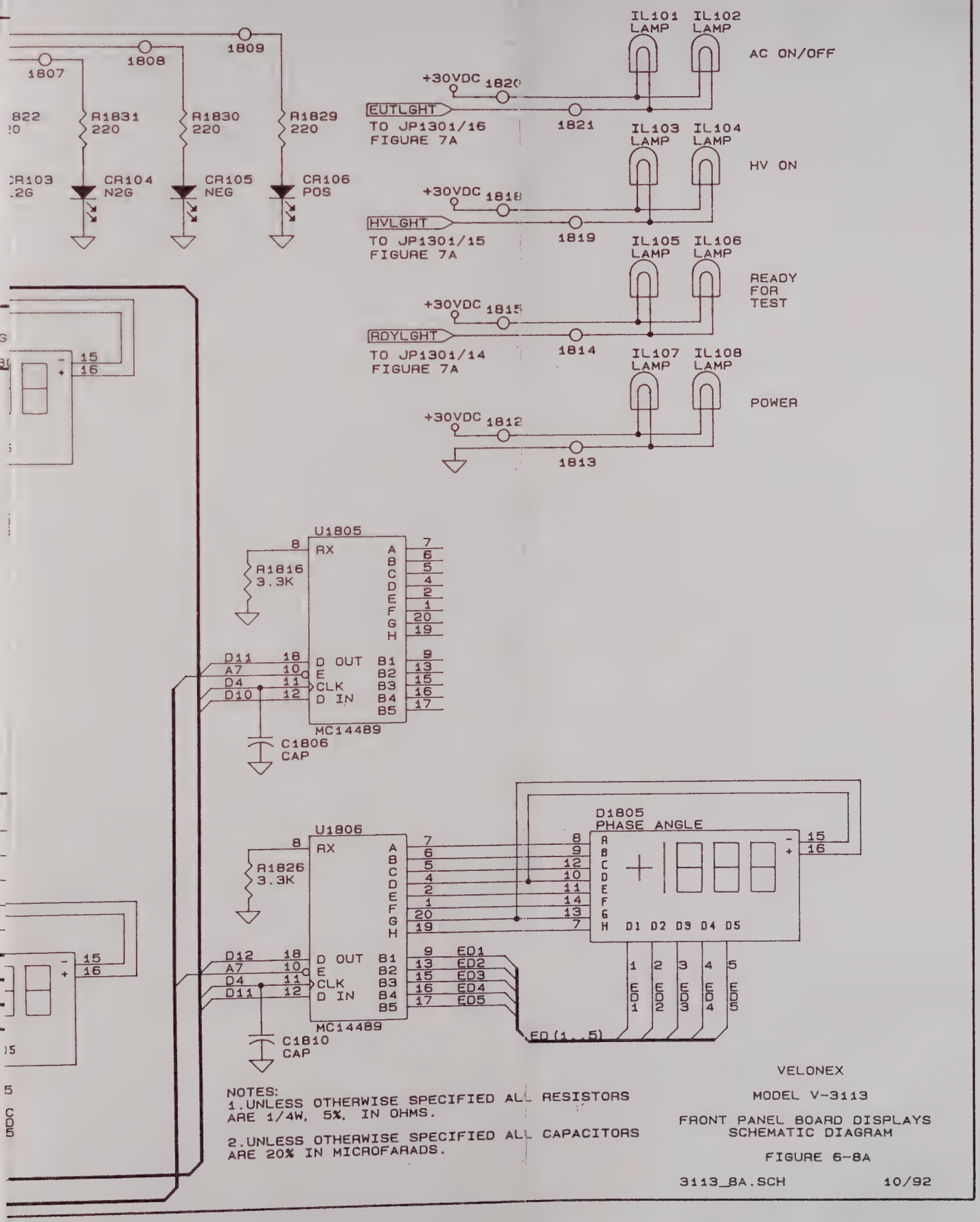
MODEL V-3113

FRONT PANEL BOARD
SCHEMATIC DIAGRAM

FIGURE 6-8

3113_8.SCH 7/91


U1801
B0
B1
B2
B3
B4
B5
B6
B7
D0 Q0
D1 Q1
D2 Q2
D3 Q3
D4 Q4
D5 Q5
D6 Q6
D7 Q7
OC
G
A6
74HC373
C1811
CAP
1811
1810
R1832
220
R1821
220
CR101
START
CR102
PE2G
FIGURE 6A
B[0..7]
D[0..12]
A[4..7]
U1802
RX
R1801
3.3K
D OUT
E
CLK
D IN
MC14489
D8
A7
D4
D3
A7
C1801
CAP
C1802
CAP
D1801
PRF
D1 D2 D3 D4
AD1
AD2
AD3
AD4
AD5
AD[1..5]
U1803
R1802
3.3K
D9
A7
D4
D8
C1804
CAP
U1804
R1807
3.3K
D10
A7
D4
D9
C1805
CAP
D1803
TEST TIME
CD1
CD2
CD3
CD4
CD5
CD[1..5]
+5VDC
C1808
0.01
C1803
0.01
C1807
0.01
JP1803B
GND
JP1803D
GND
A[6..7]



NOTES:
1. UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE 1/4W, 5%, IN OHMS.

2. UNLESS OTHERWISE SPECIFIED ALL CAPACITORS ARE 20% IN MICROFARADS.

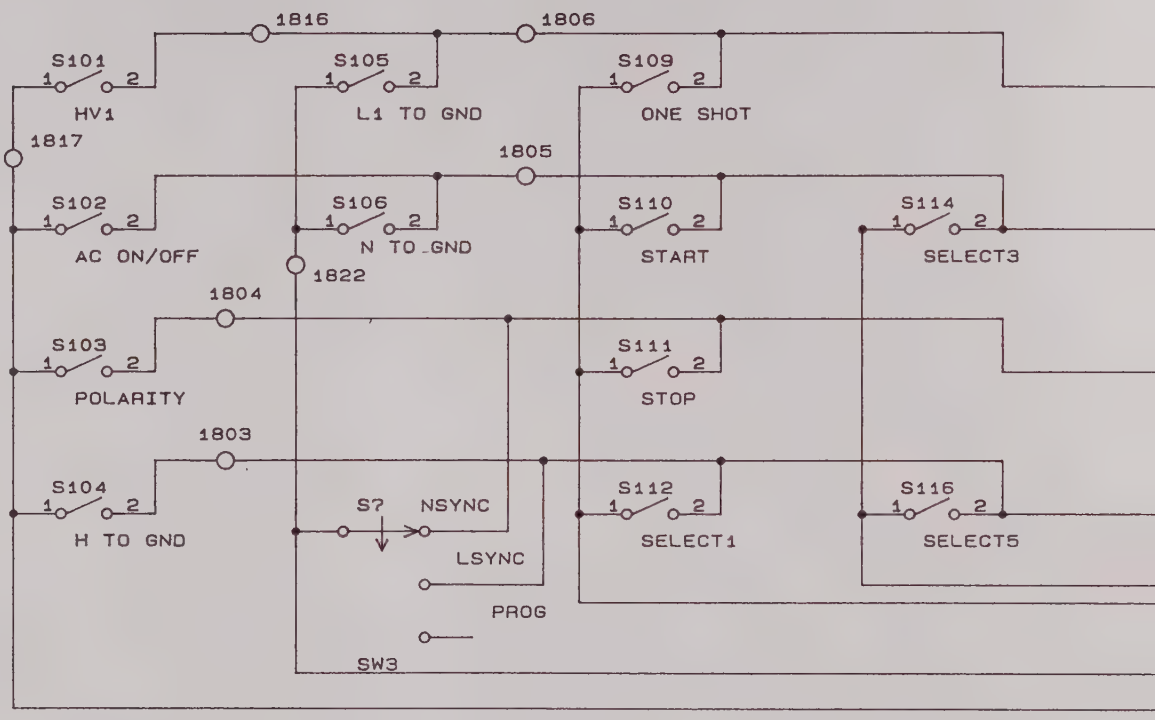
VELONEX

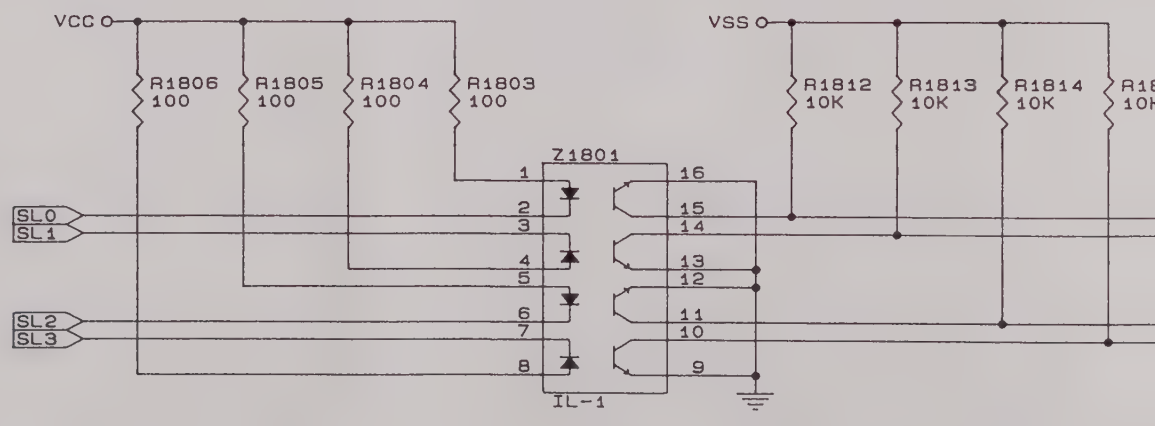
MODEL V-3113

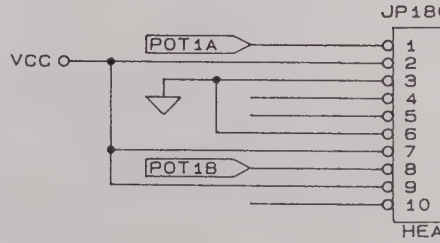
FRONT PANEL BOARD DISPLAYS SCHEMATIC DIAGRAM

FIGURE 6-8A

3113_8A.SCH 10/92

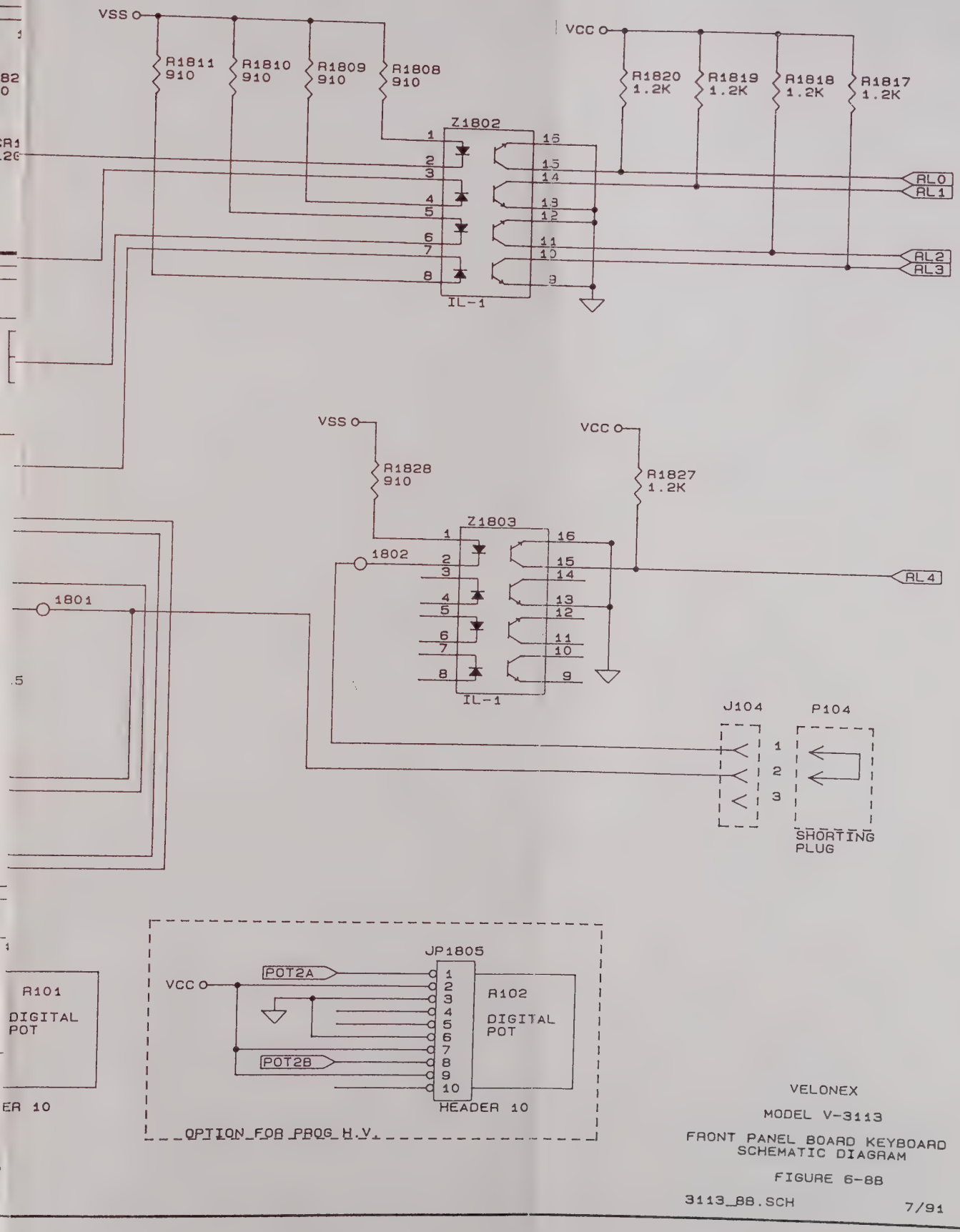






NOTES:
1. UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE 1/4W, 5%, IN OHMS.

2. UNLESS OTHERWISE SPECIFIED ALL CAPACITORS ARE 20% IN MICROFARADS.



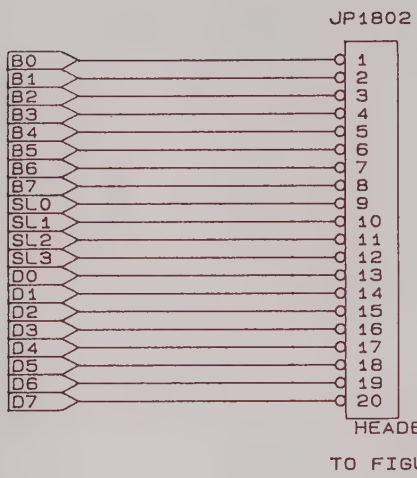
VELONEX

MODEL V-3113

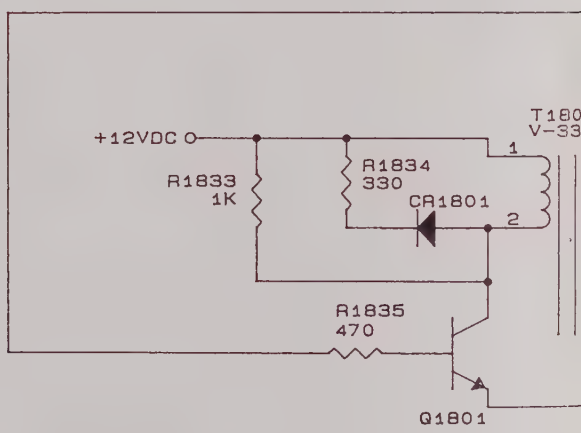
FRONT PANEL BOARD KEYBOARD SCHEMATIC DIAGRAM

FIGURE 6-88

3113_88.SCH 7/91

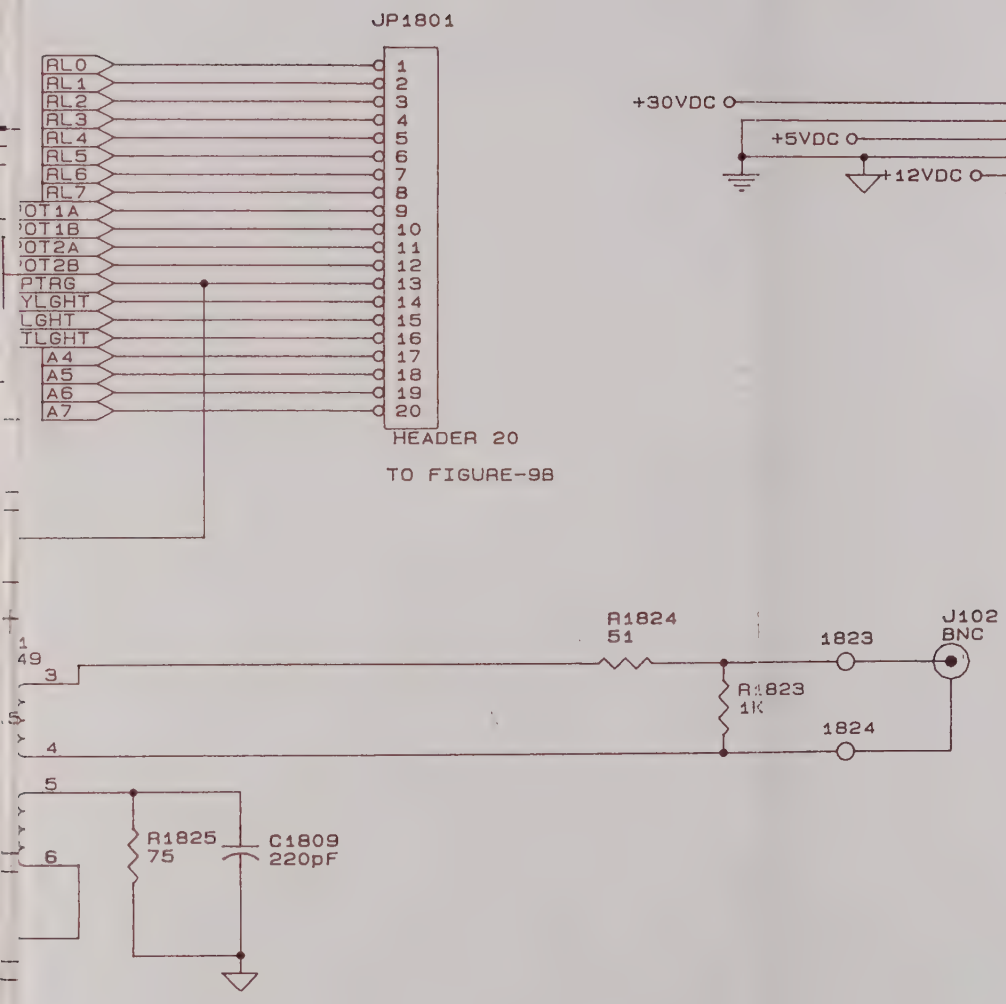


TO FIGURE-9B



NOTES:
1.UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE 1/4W, 5%, IN OHMS.

2.UNLESS OTHERWISE SPECIFIED ALL CAPACITORS ARE 20% IN MICROFARADS.



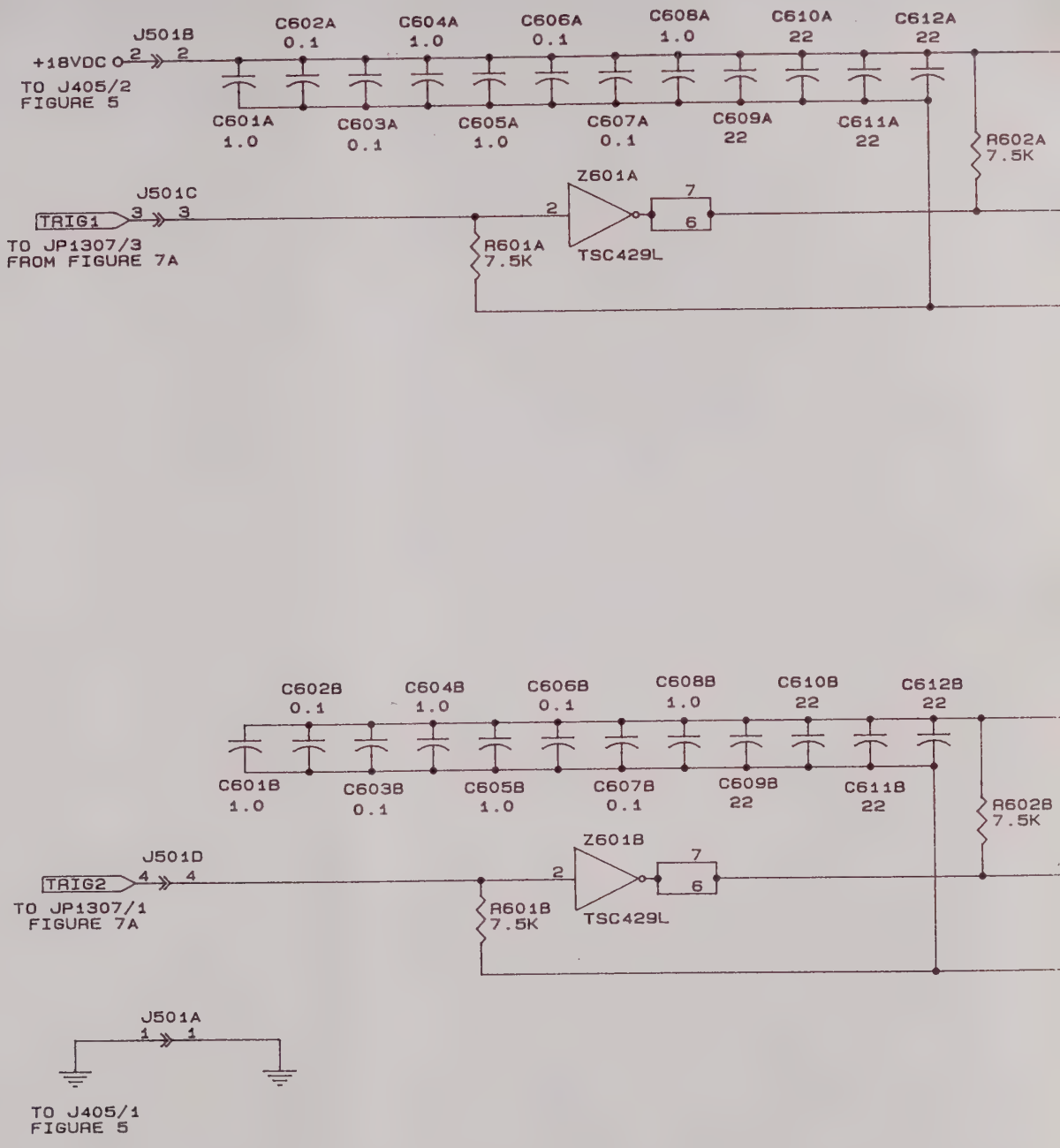
VELONEX

MODEL V-3113

FRONT PANEL BOARD CONNECTORS
SCHEMATIC DIAGRAM

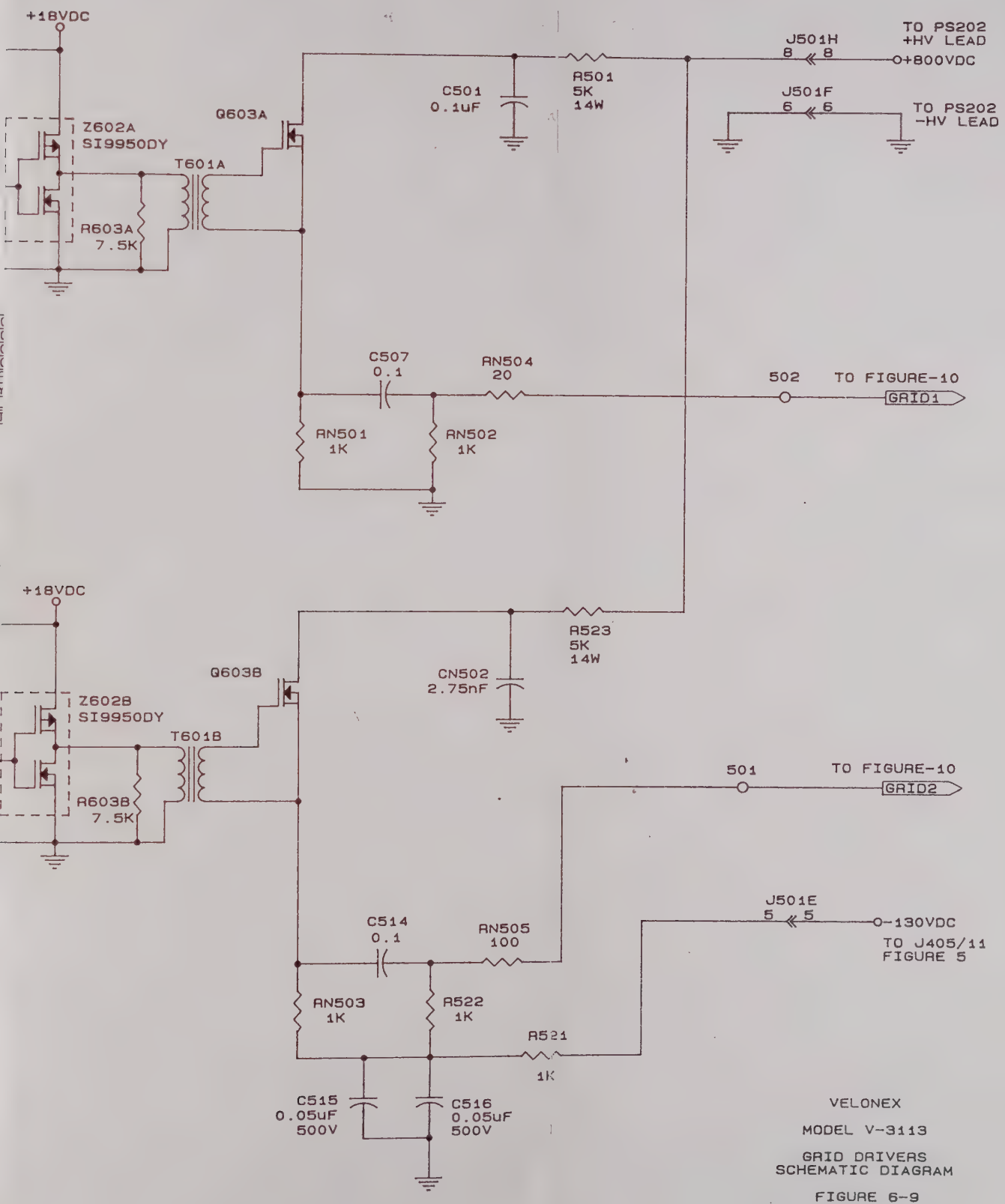
FIGURE 6-8C

3113_8C.SCH 7/91



NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE 2W IN OHMS.
2. UNLESS OTHERWISE SPECIFIED, ALL CAPACITORS ARE IN MICROFARADS
3. Z601 POWER PINS 1 & 8 ; GND PINS 4 & 5.
4. +24VDC, +800VDC AND -130VDC ARE FROM FIG-7.



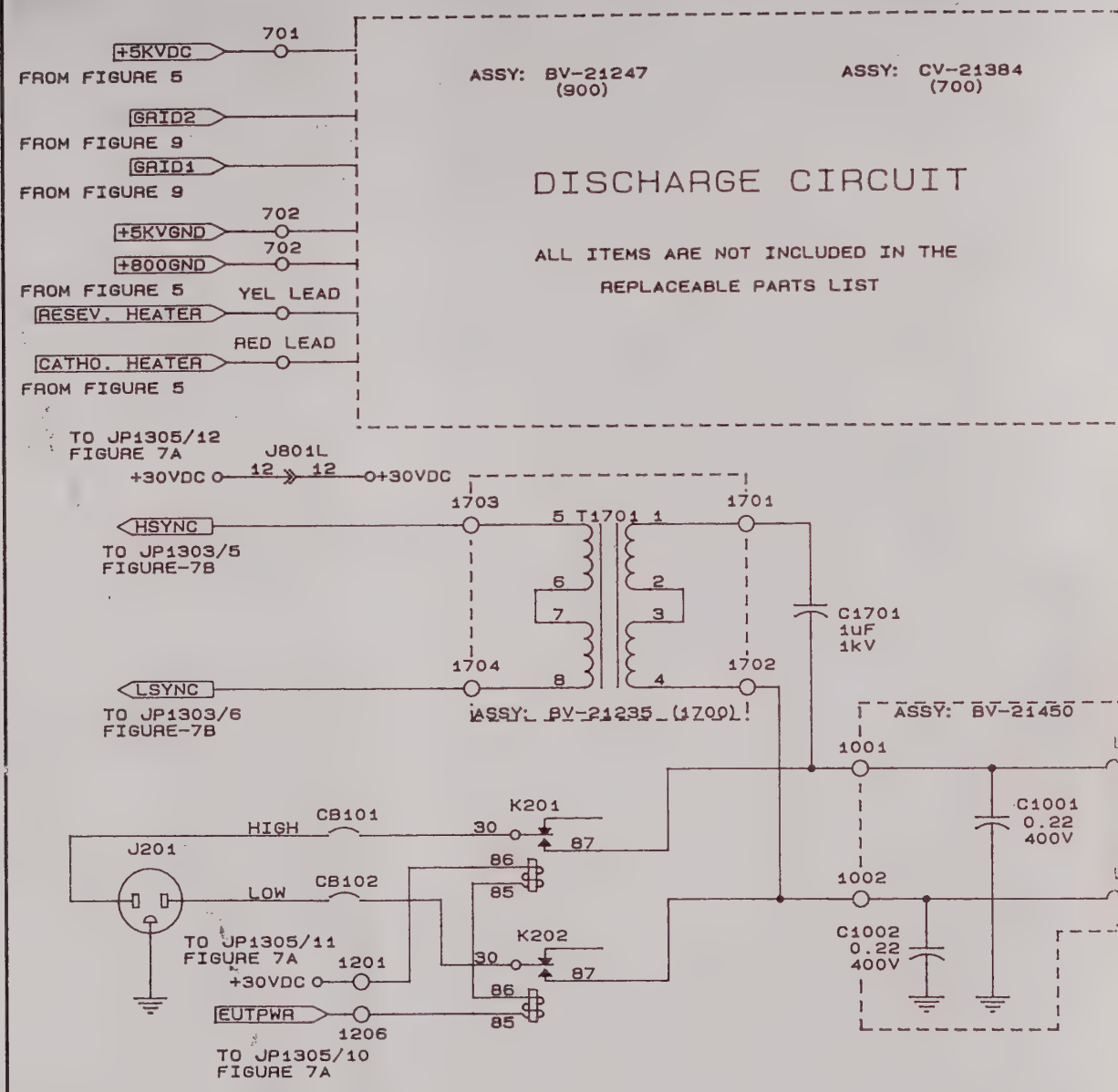
VELONEX

MODEL V-3113

GRID DRIVERS
SCHEMATIC DIAGRAM

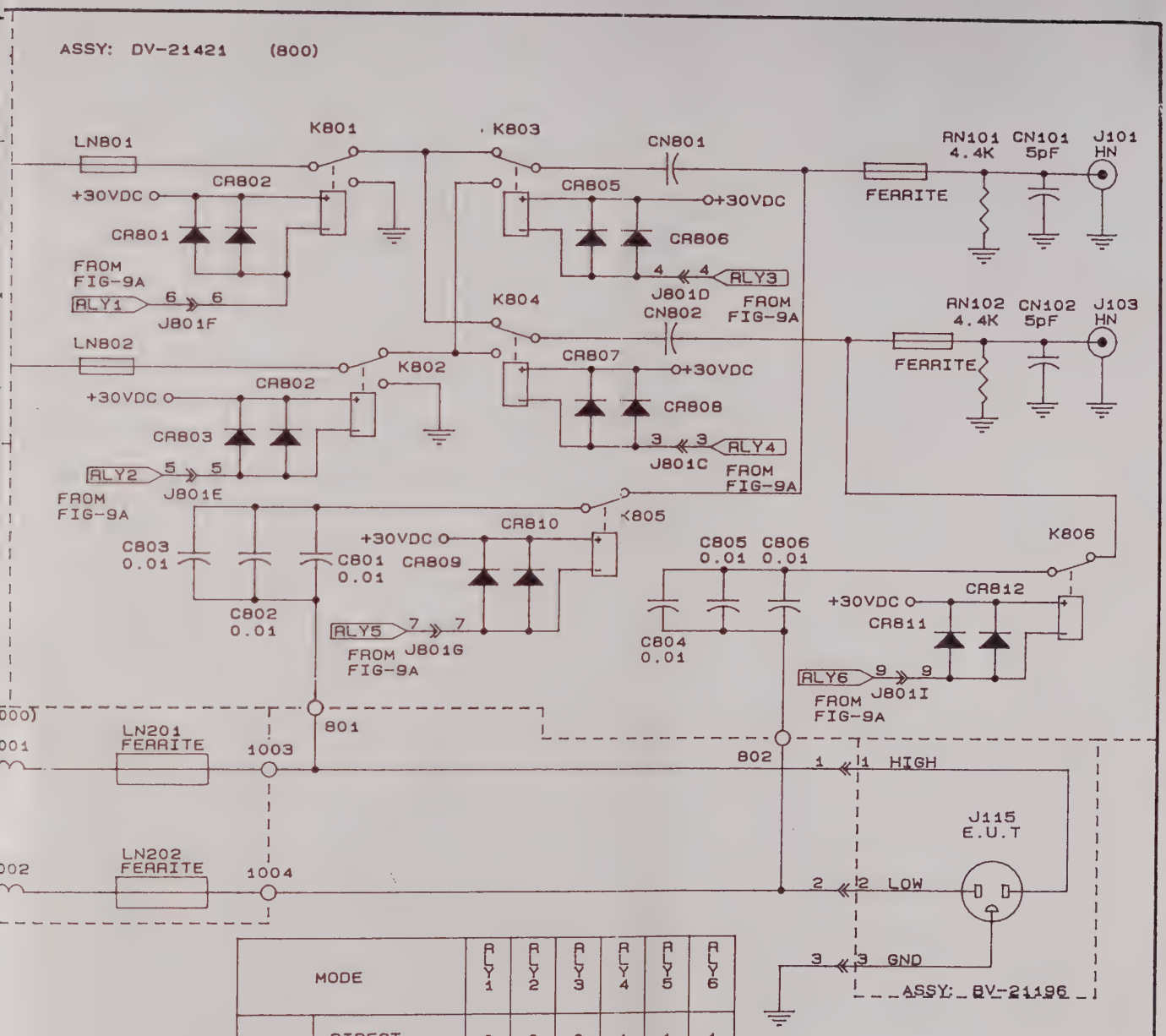
FIGURE 6-9

3113_9.SCH 10/92



NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE 2W AND IN OHMS.
2. UNLESS OTHERWISE SPECIFIED, ALL CAPACITORS ARE IN MICROFARADS.
3. ALL SIMILAR NUMBERED CONNECTORS WITH DIFFERENT ALPHA SUFFIXES REFER TO THE SAME CONNECTOR.
4. 24VDC POWER SUPPLY IS FROM FIG-7.



	MODE	RLY1	RLY2	RLY3	RLY4	RLY5	RLY6
POS	DIRECT	0	0	0	1	1	1
	H TO GND	0	1	0	1	0	1
	L TO GND	0	1	1	0	1	0
	H+L TO GND	0	1	0	0	0	0
	H TO L	0	0	0	1	0	0
NEG	DIRECT	0	0	1	0	1	1
	H TO GND	1	0	1	0	0	1
	L TO GND	1	0	0	1	1	0
	H+L TO GND	1	0	1	1	0	0
	H TO L	0	0	1	0	0	0

JXXXA
1 1
BOARD SIDE PLUG SIDE

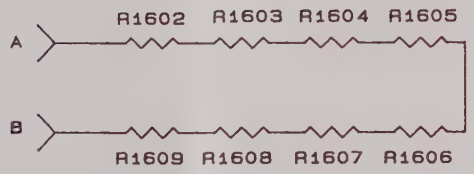
VELONEX
MODEL V-3113
DISCHARGE/COUPLER SCHEMATIC DIAGRAM
FIGURE 6-10
3113_10.SCH 10/92

RN101
R102 R103
2.2K, 2W EA

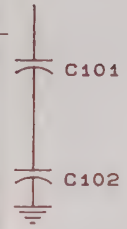
RN102
R104 R105
2.2K, 2W EA

C10
10p

RN301
R302 THRU R313, 1M, 2W EA.

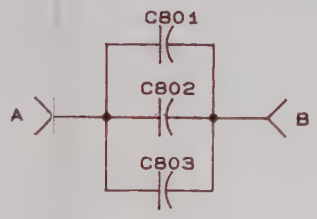


RN1601
R1602 THRU R1609, 470K, 2W EA.

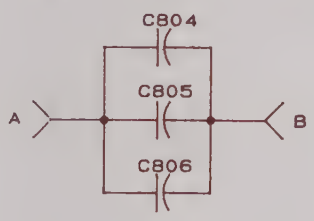


:N101
1 C102
1KV EA

CN102
C103 C104
10pF, 1KV EA



CN801
C807 THRU C809, 0.01uF, EA.



CN802
C810 THRU C812, 0.01uF, EA

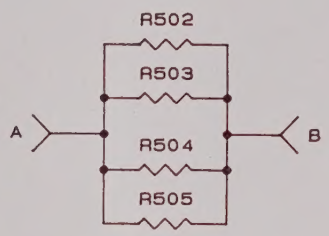
VELONEX

MODEL V-3113

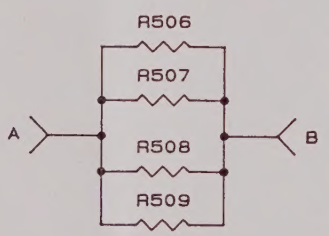
COMPONENT NETWORKS
SCHEMATIC DIAGRAM

FIGURE 6-11A

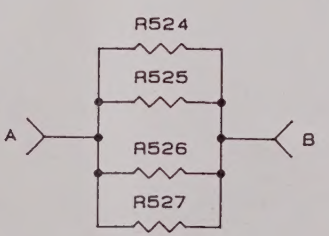
3113_11A.SCH 7/91



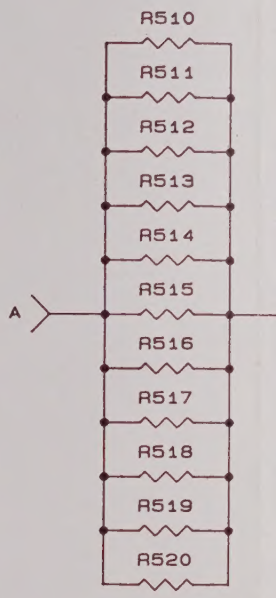
RN501
R502 THRU R505, 4.3K, 2W EA.



RN502
R506 THRU R509, 4.3K, 2W EA.

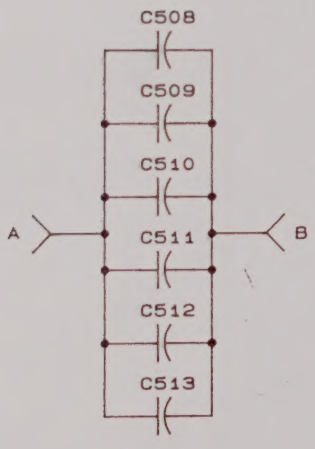


RN503
R524 THRU R527, 4.3K, 2W EA.

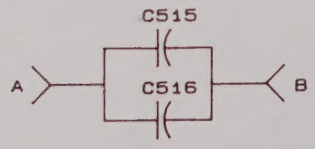


RN504
R510 THRU R520, 220, 2W

RN505
R528 THRU R532, 510, 2W



CN502
C508 THRU C512, 500pF, 1.5KV EA.
C513 IS 250pF, 1.5KV.



CN503
C515 AND C516, 0.05uF, 500V EA.

VELONEX

MODEL V-3113

COMPONENT NETWORK
SCHEMATIC DIAGRAM

FIGURE 6-11B

3113_11B.SCH 7/91

MP MASTER
MA21908